PRICE 50 CENTS

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

AUGUST 2, 1954

- *A mist cooling progress report*
- *Hard chrome plating to tenths*

Jig borers in profusion . . . *see page 2*

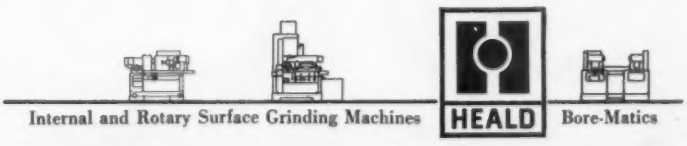
perhaps a fresh approach would help?

CUTTING costs without cutting corners can be a tough problem. And when you've got to *improve* your product at the same time, it may seem insurmountable. Yet to assure success in today's competitive market, both of these things must be done.

Perhaps a fresh approach — an outside viewpoint by precision — finishing *specialists* will supply just the answer you're looking for. New Heald developments in automation, way-type and transfer Bore-Matics, interchangeable tooling, improved internal grinding and loading methods can now be applied to a wide variety of jobs.

You can't escape competition. But you *can* let your Heald man keep you ahead of it!

for *fresh thinking* in precision finishing, it pays to come to Heald!



Internal and Rotary Surface Grinding Machines — Bore-Matics

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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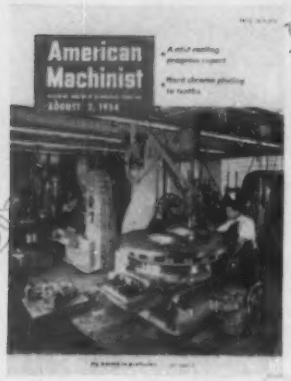

chips

JIG-BORING ROOM . . . Unusually large and well set up is the jig-boring room at Kingsbury Machine Tool Corp, Keene, N. H. It is a 1-story, 43 x 72-ft (inside) brick building attached to and opening into the toolroom, fully air conditioned and glass-wool roof-insulated. Fluorescent ceiling lights supplement a glass-brick northeast wall. Twenty precision machines are housed there: Pratt & Whitney 2A and 3A, three Kearney & Trecker 3C, two Cleereman, two Moore, and five Sip jig borers; two Moore jig grinders, three Lucas horizontal boring mills, and a DeVlieg jig mill. Shown (left to right) are: P&W 2A, two K&T 3C, Swiss Hydroptic B (obscured), P&W 2A (center), two Swiss, and a K&T 3C. Limits of 0.0002 in. are common. The job in foreground is an index table for a big Kingsbury central-column machine; workholding devices are the other principal product.

MIST COOLING . . . A progress report on mist or spray cooling, showing experiences at Allis-Chalmers and Giddings & Lewis, forms our current Special Report. Included are applications on planers at G&L and on some 200 installations at A-C on a wide variety of machines. This is the second report on the subject, our first appearing Sept 14, 1953. It occasioned so much comment that we felt you'd want more on the subject.

MANAGEMENT . . . Periodically, we are impressed by the extraordinary attention to worker welfare shown by a plant management. Here's a surprising one found by Fred Colvin on a recent trip—the setup in a very progressive Mexican plant—even including schools for employee's children.

TOOLING . . . Two articles also feature tooling, one from Westinghouse showing drillpress and miller setups for automatic slotting of curved holes, the other showing case studies from five plants, and including a converted forging press, abrasive blasting, retooling a turret lathe, and safer tool grinding.

HARD CHROME . . . Our lead article explains how to chrome-plate to ten-thousandths, without special anodes or grinding or lapping afterwards. It's by George deMirjian of Chrome Electro-Forming Co, Detroit.

HARD BRONZE . . . The latest on fabricating new wear-insert materials for drawing dies for stainless is told by Arnold Walz, general manager of Faigle Tool & Die, Dearborn, Mich. It's a 4-page story.

GRINDING . . . A basic story on grinding wheels and how to choose them has been written by Norman P Robie of Electro Refractories & Abrasives Corp, Buffalo. It gives the fundamentals — bonds, pores, abrasives, and the like.

COMING . . . Aug 16 *AM* includes a Special Report on planning supervisory training, plus articles on furnace-brazing and hot-forming titanium, cutoff tools, assembly of control devices, aand more on hard chrome plating. The cover is a very unusual shot of assembly of a big extrusion press at Convair.

ABRASIVE EXPERT . . . Norman P Robie, author of our article on grinding wheels this issue, is in charge of grinding-wheel research at Electro Refractories and Abrasives Corp, Buffalo, NY. He's worked as a research chemist, scientist for the National Bureau of Standards, and as research supervisor for Carborundum Company. He has 55 patents (US and foreign) in the abrasives field, covering liquid phenolic resins and glass-cloth reinforcements. His degrees include a BS in chemistry and an MS in chemical engineering; he's also a member of American Chemical Society.

How to multiply production of straight bevel CONIFLEX® gears and pinions *by as much as 500%*

You can do it with the new No. 104 Straight Bevel CONIFLEX Generator.

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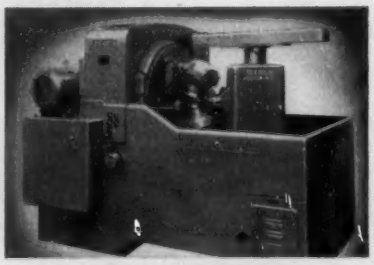
The range of capacity, and the ease of setup, make the No. 104 Straight Bevel CONIFLEX Generator ideal for jobbing.

Calculations have been reduced to a minimum and can be done long hand or with slide rule.



The No. 104 Straight Bevel CONIFLEX Generator completes gears up to 8½" diameter and 1⅜" face width, and from 20 to 3 DP.

We will be glad to send a bulletin giving further details on request.

® Straight bevel gears with localized tooth bearing.

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CINCINNATI

PRODUCTION PACKAGE by Cincinnati Hydro-Broaches 970 cams per hour

All work and no play . . . for the machine . . . must have been the motto in mind when Cincinnati Application Engineers developed the equipment shown here. It's a complete production package, consisting of a CINCINNATI No. 5-54 Single Ram Vertical Hydro-Broach with all the necessary tooling. Operation is simplicity itself. ¶ The operator merely places four parts (two stacks of two) on the air operated fixture, and the production cycle is automatic. At the top of the stroke a pusher moves the work to the edge of the fixture, where the pieces drop into position on tapered pins and are pneumatically clamped when the ram descends. On the upward stroke, the finished parts are ejected into a chute. **The ram cycle proceeds continuously broaching 970 cams per hour.** This equipment may give you some ideas in raising production and reducing cost. It is typical of the work handled by Cincinnati Application Engineers. These men are willing to give you the benefit of their many years' experience in tooling up new Hydro-Broach machines. May we hear from you? Please give us complete engineering and production data.

THE CINCINNATI MILLING MACHINE CO.
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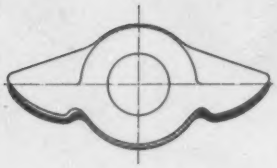
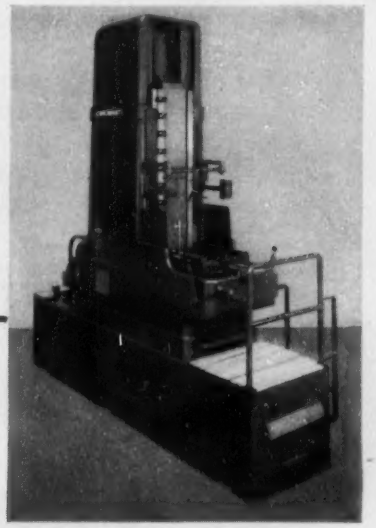
CINCINNATI No. 5-54 Single Ram Vertical Hydro-Broach, tooled up by Cincinnati Application Engineers to broach the cam profile and clearance on automotive cams.



Drawing of the cam broached on the equipment illustrated here. Color line indicates broached surface. Production 970 cams per hour.



CINCINNATI Single Ram Vertical Hydro-Broach Machine. Seven sizes are available up to 10-ton broaching force, 66" stroke. Write for catalog No. M-1745. Data for larger sizes on request.

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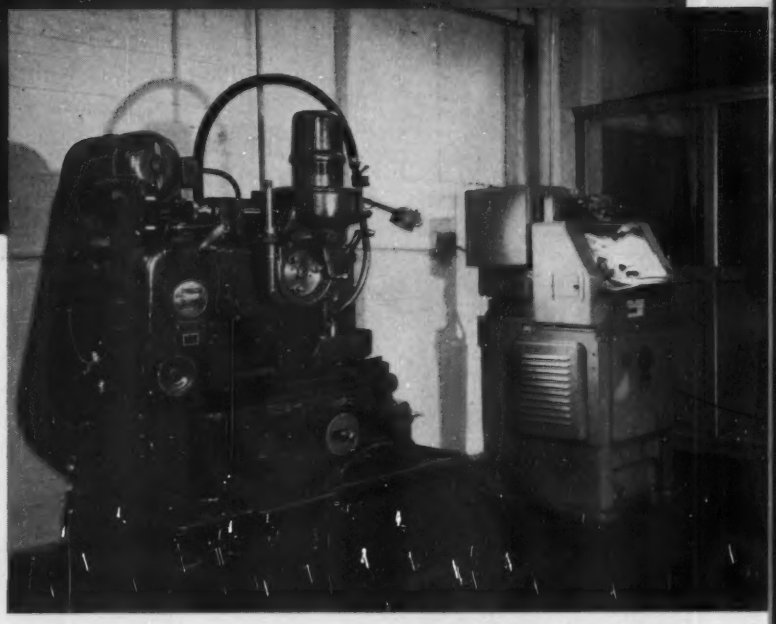

THE *Fellows*

basic for GEAR TRAINS in ELECTRONIC INSTRUMENTS

Runout tolerances to 'two tenths' are an everyday requirement in a train of gears so perfect that they spin freely at the lightest finger touch.

This unit, with gears from a production lineup of Fellows Gear Shaper, Shaving Machine and "Red Liner" at the Electronic Instrument Division of Ketay Manufacturing Company, New York, is evidence of the results of quality-control at its best.

In spite of the greater accuracy demanded for these sensitive electro-mechanical devices, gear production costs are still of vital importance. The ability of Fellows machines and tools to hold costs under control and to work within the most critical tolerances is being proved every day on the production lines of many industries.

If you have gears to cut, you owe yourself a close look at the cost-control potentials of Fellows equipment. The nearest Fellows Office will be glad of an opportunity to send literature or offer personal counsel.

GEAR SHAPER COMPANY

Head Office and Export Department: 78 River Street, Springfield, Vermont.
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For Finish, Accuracy

...that INCREASE PRODUCTION ...CUT COSTS

VAN NORMAN

MANUFACTURERS of—Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

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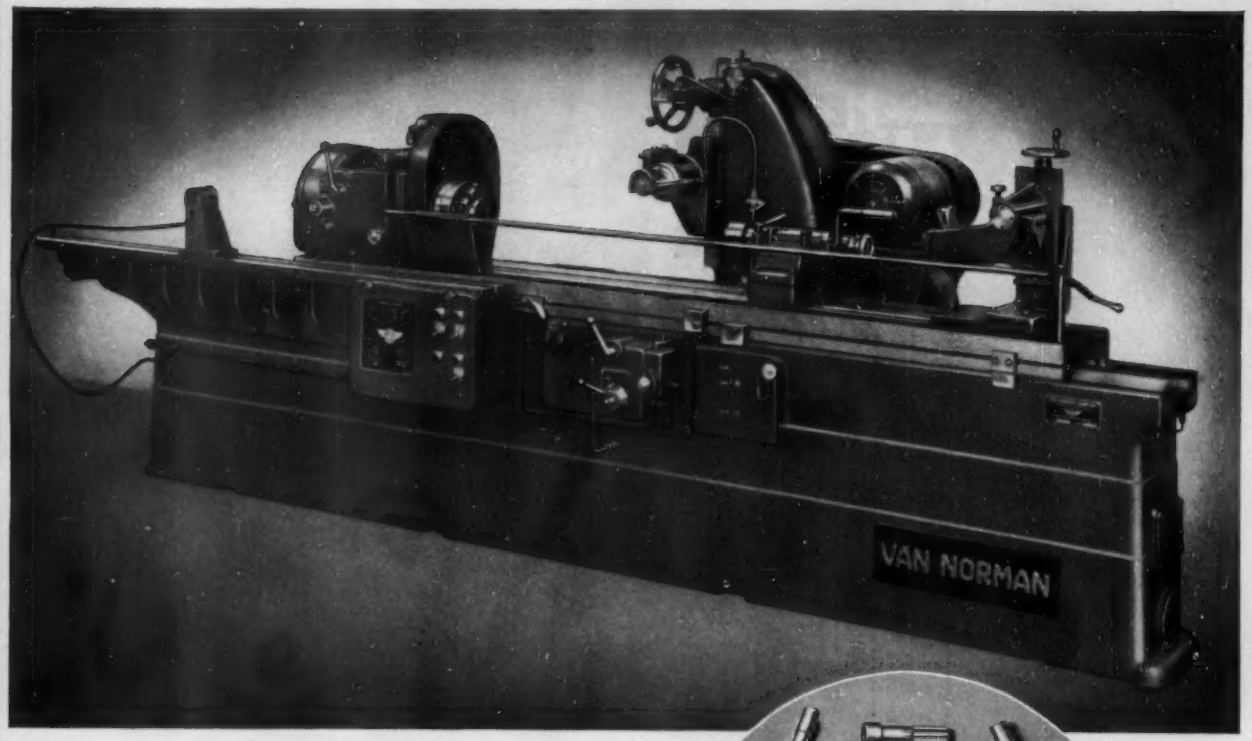


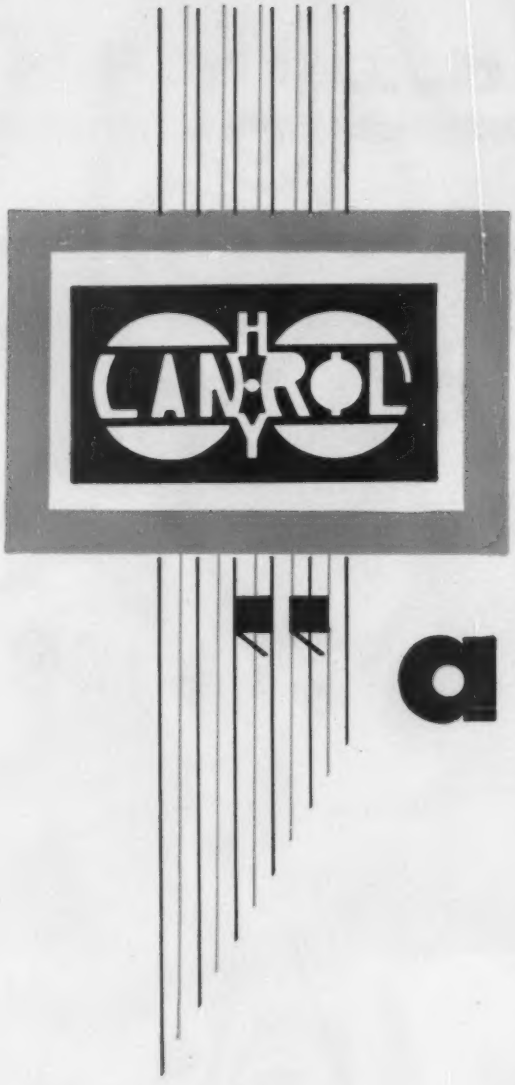
Operating on an automatic cycle with formed wheels, these Van Norman Grinders give you high finish and accuracy at speeds that increase production and reduce costs.

These grinders are adaptable for grinding internal and external helical or spur gears . . . straight taper and helical splines . . . and can be applied to shave splines.

Van Norman Engineers, specialists in grinding, are available to help you solve your spline and gear grinding problems. Write for their assistance, today. There is *no* obligation for their services.

Typical parts ground at high production speeds on Van Norman Spline and Gear Grinders

COMPANY | **SPRINGFIELD 7, MASSACHUSETTS**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a new

threading service"

With the addition of the LAN-HY-ROL Thread Rolling Machine, LANDIS offers a line of Threading Equipment unmatched by any other manufacturer. LANDIS Equipment is available for the production of threads by Cutting, Grinding, Rolling, or Tapping—Thread Cutting Machines, Die Heads and Collapsible Taps, Thread Grinders, Thread Rolling Attachments, and now Thread Rolling Machines.

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In addition to a complete line of equipment for the production of all types of threads, LANDIS offers all manufacturers knowledge and experience in the field of Threading extending over more than 50 years. Our Engineering Department is at your service to render help on any phase of Threading—design, methods, or equipment.

THE WORLD'S LARGEST MANUFACTURERS OF THREADING EQUIPMENT - CUTTING · TAPPING · GRINDING · ROLLING

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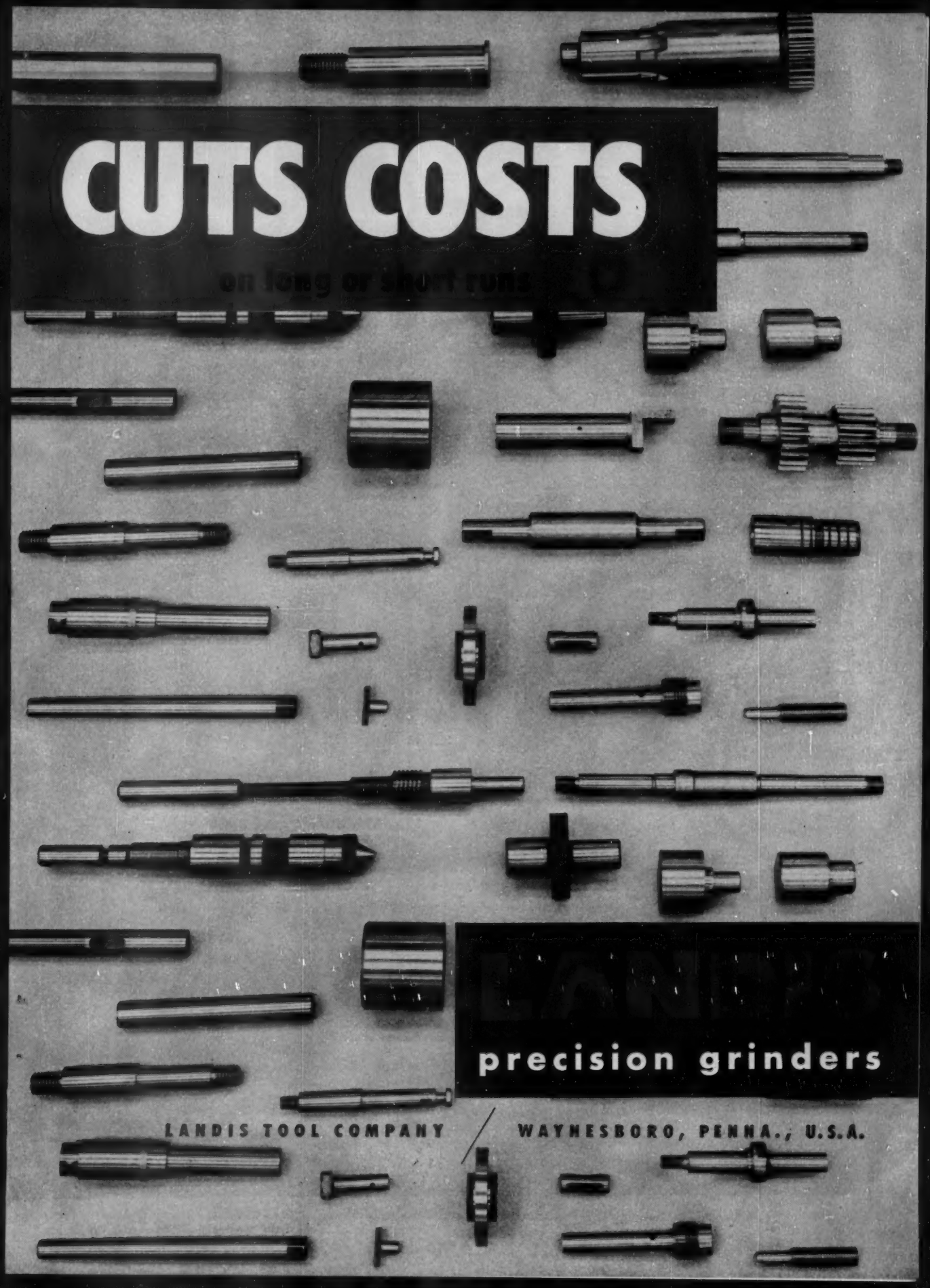
CUTS COSTS
on long or short runs
precision grinders
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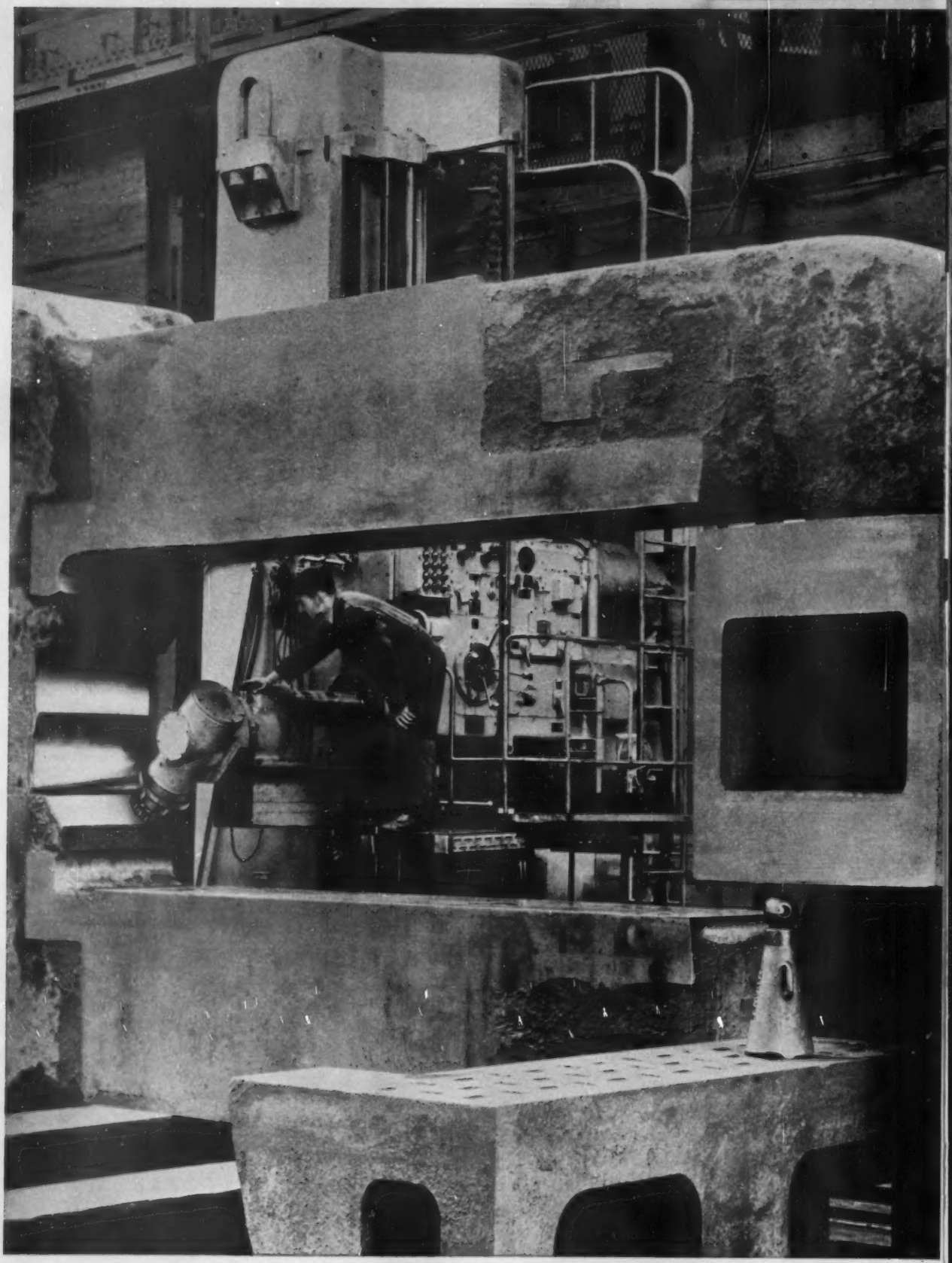

This Giddings & Lewis 7-in. spindle floor-type, horizontal boring machine with underarm ram and angular milling attachment completely machines the window of a large rolling mill housing.

KING-SIZE

for bigger profits!

Giddings & Lewis floor-type, high-power, precision horizontal boring, drilling and milling machines are unmatched in accuracy and production capacity

Giant-size, cast-iron and steel castings with many surfaces — requiring any combination of precision milling, boring or drilling — can be bigger profit-makers when you machine them on Giddings & Lewis 50 Series horizontal boring machines.

You'll find it highly profitable to mill, face, turn and bore on these up-to-the-minute designed machines. Optional equipment permits even greater range of applications. Standard arrangements and attachments include—underarm spindle supports, angular or offset milling heads, tracer controlled contouring equipment and continuous feed facing heads.

In addition to bigger profits, you also benefit from higher standards of machining accuracy, more production, greater flexibility and versatility of operation.

For complete information on 50 Series, heavy-duty, horizontal boring, drilling and milling machines — in table, floor or planer types — contact your Giddings & Lewis representative or write for Catalog 50-F and Bulletin N-1 for underarm arrangement.

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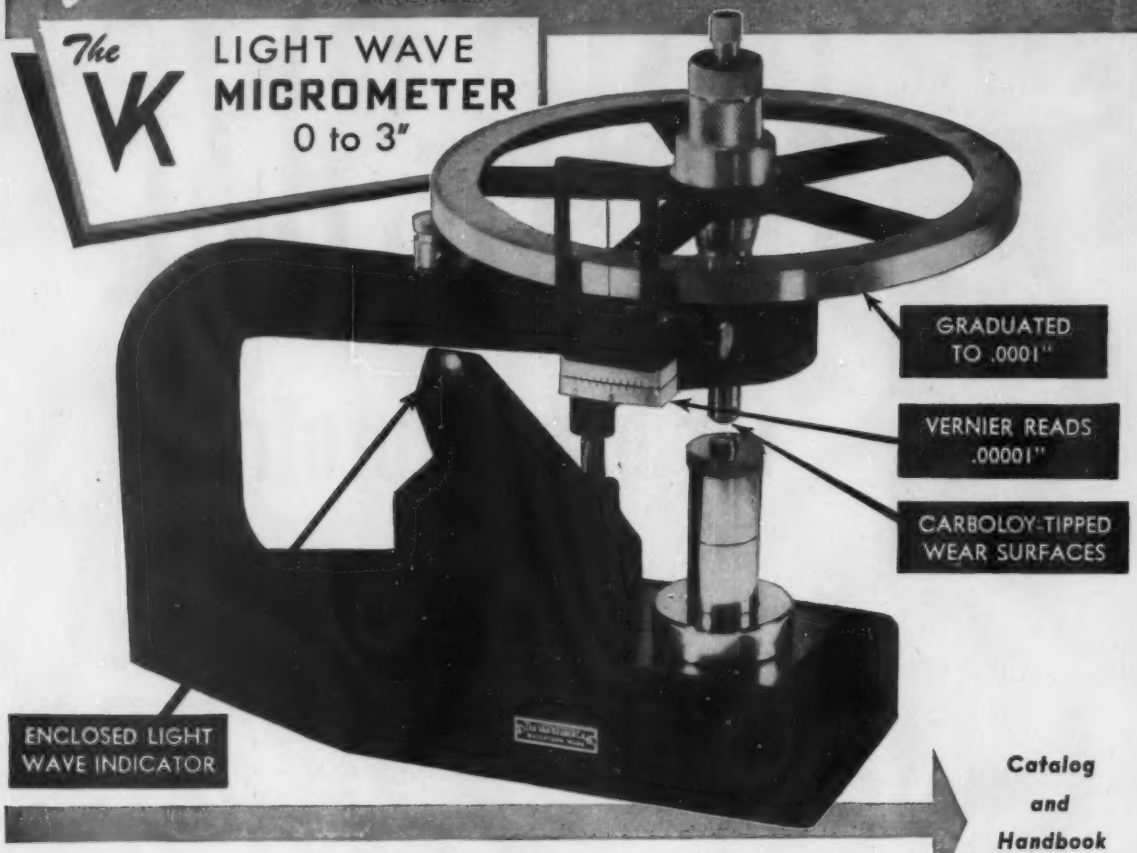
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools: Horizontal Boring, Drilling and Milling Machines—table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines; Vertical Boring Mills; and Davis Cutting Tools.

for that last hundred-thousandth

The VK LIGHT WAVE MICROMETER 0 to 3"



The Van Keuren Light Wave Micrometer is an instrument of exceptional accuracy, ideal for measuring plug gages or small precision parts. Use it when you're after "that last hundred thousandth" involved in so many of today's measurements. The 0 to 3" instrument shown above has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy, and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non-parallax vernier index which enables readings to be made to .00001". It has an index lock and carboloy-tipped anvil and spindle. This sturdy, sensitive instrument weighs only 17 pounds, and is in reality a portable measuring machine of inbuilt and sustained accuracy.

The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision . . . fast, accurate and profitable.

Catalog and Handbook No. 35

This 220-page volume represents years of research by the Van Keuren Co. It presents a simple and exact method of measuring screws and worms with wires, tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods. Ask for your copy . . . sent free on request by writing: The Van Keuren Company, 173 Waltham St., Watertown, Mass.

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35th YEAR

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Multiple spindle automatic builders do not deny the importance of good frame design. As early as 1920 Cone's revolutionary frame was substantial evidence that Cone did something about it.

For some time there has been discussion concerning the relative merits of the use of 100% carbide tooling on multiple spindle bar automatics. There has been very little information made available about successful carbide application to this type of machine by its builders or by carbide suppliers. But Cone is doing something about it.

The Conomatic Carbide Development program is accumulating much helpful information for "automatic" users through test runs under production conditions. The illustration is an example of such information applied to an actual production run. Full data is available.

Action speaks better

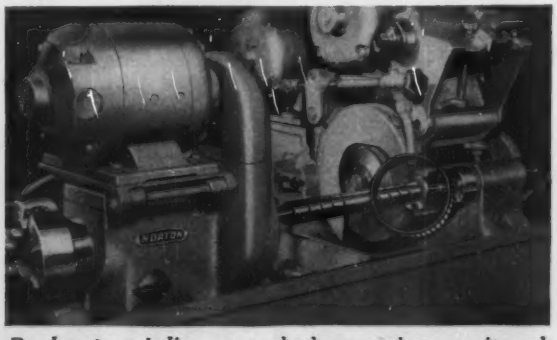
MATERIAL—ALUMINUM: Hole drilled with 1" and 1 1/16" dia. drills to 1½" depth, and tapped to ¾" depth.

	HSS	CARBIDE
Cycle Time	90 secs.	**11 secs.**
Work Spindle Speed	270 R.P.M. at 104 S.F.	**830 R.P.M. at 320 S.F.**
Tool Wear	5,000 pcs. per grind	**20,000 pcs. per grind**

Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

He can change-over fast from this internal grinding set-up on the Norton 10" x 20" Universal grinder. The internal grinding spindle, permanently hinged to front of wheel side, swings up out of the way — and he's ready for external, face or angular wheel slide jobs.

Hollow spindle in headstock allows work up to 1" diameter and longer than machine to be passed clear through.



Dead center grinding — note chuck mounted at opposite end of head, a real set-up time saver.

Quicker set-ups here... *increase your profit margin*

on many different grinding jobs

Norton 10" x 20" and 10" x 24" Universal Grinding Machines are famous for versatility, accuracy and fast, smooth performance

Do you want to save valuable time on many grinding jobs? Want a multi-purpose machine for rough cuts or finest precision finishing?

Then you want the Norton 10" x 20" or 10" x 24" Universal Grinder . . . that helps you produce more work at less cost.

The Norton 10" Universal is a multi-purpose grinding machine that can do external, internal, face and angular wheel-feed grinding.

Head and footstock are interchangeable, permitting simplified set-up on jobs involving shoulders or spacers, especially on angular grinds. Set-ups are made easier on chucking jobs by the D1-3" camlock nose on one end of the headstock spindle, and the provision for permanent chuck mounting. The headstock is easily swivelled 180° to change from dead center to chucking work.

The wide versatility of this machine proves once more that you economize when you modernize with a new Norton machine. For complete information see your Norton representative or write for Catalog 170-3. NORTON COMPANY, Machine Division, Worcester 6, Mass.

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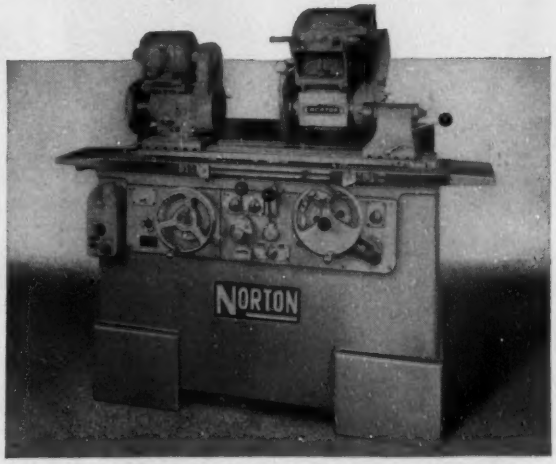
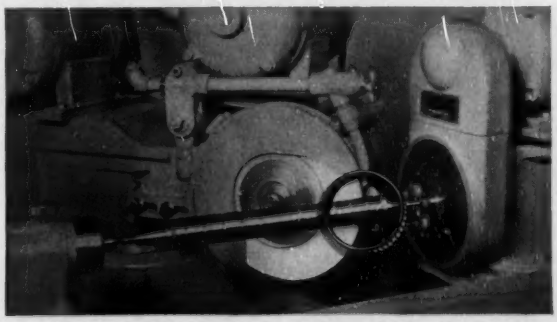


Norton 10" x 20" Universal Grinding Machine. Wheel head swivels 360°. Internal spindle hinged to front of slide and swings up out of way when grinding external work.



Head and footstock are reversible. No need to change wheel and drive to the other end of spindle.

The significant results of

THE FIRST 120 DAYS OF

FRANCIS J. TRECKER, *President*
Kearney & Trecker Corporation

A report by
Francis J. Trecker, President
Kearney & Trecker Corp.

■

JUST four short months ago — as this is written — Kearney & Trecker demonstrated again its leadership in the machine tool industry by pioneering a program, unique among machine tool manufacturers, whereby its products might be obtained on a lease basis, as well as by outright sale or conditional sales agreement.

The results of the Kearney & Trecker TOOL-LEASE program have exceeded even our most optimistic forecasts. It has been a great stimulant of inquiries and new business, particularly where the replacement of worn and obsolete milling and precision boring equipment has been under consideration.

At this time the TOOL-LEASE program has been responsible for several million dollars' worth of new business. The success of this program is ample evidence that our decision to lease was founded on a correct appraisal of the needs of metalworking industry for some way to modernize its plant equipment without delay where working capital for the moment must be used for other purposes. In this respect TOOL-LEASE is serving a practical and

KEARNEY & TRECKER CORPORATION

builders of precision and production

TOOL-LEASE

useful purpose, and we are both pleased and grateful for the acceptance this program has been accorded.

The Kearney & Trecker TOOL-LEASE program today is an integral part of our company's general sales policy. The soundness of the program is evidenced — not only by the 120 day record of leases made by large and small companies alike — but also by the many complimentary letters received from leading figures in almost every executive capacity in business and industry.

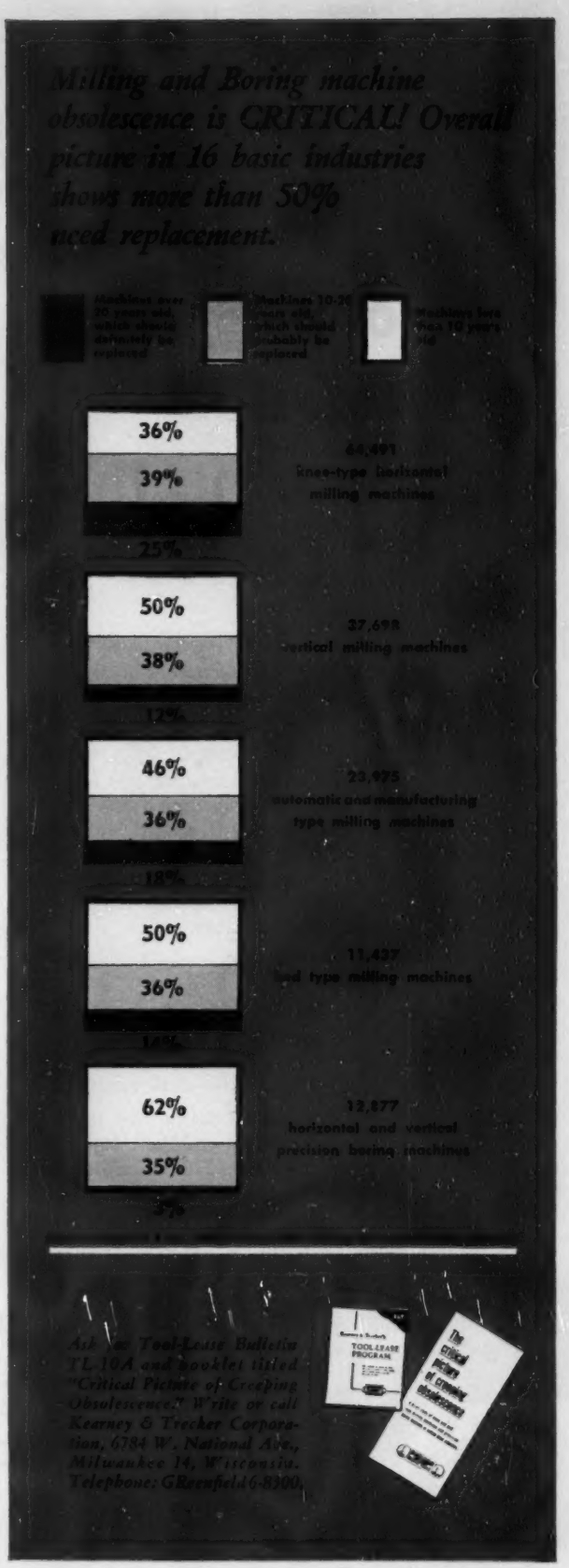
Today our sales organization is fully prepared to explain the details of the Tool-Lease program to anyone interested. Briefly, it offers a choice of three basic plans with varying options to continue the lease, terminate the lease or purchase the equipment.

Among the proved advantages of Tool-Lease are: Releases working capital for production expansion. Assures you the services of a machine as long as needed, avoiding risk of obsolescence. Permits user to judge machine's merits in actual shop performance without going to expense of purchasing the machine.

We invite your letters of inquiry. For complete details on Tool-Lease including actual costs . . . for prompt service and assistance in analyzing your plant modernization problems — contact the Kearney & Trecker sales representative in your area.

TOOL LEASE
KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS
EQUIPMENT
® ©1954

machine tools - since 1898


Milling and Boring machine obsolescence is CRITICAL! Overall picture in 16 basic industries shows more than 50% need replacement.
Machines over 20 years old, which should definitely be replaced
Machines 10-20 years old, which should probably be replaced
Machines less than 10 years old
36%
39%
25%
Knee-type horizontal milling machines
50%
38%
12%
vertical milling machines
46%
36%
18%
automatic and manufacturing type milling machines
50%
36%
14%
bed type milling machines
62%
35%
3%
horizontal and vertical precision boring machines
Ask for Tool-Lease Bulletin TL-10A and booklet titled "Critical Picture of Creeping Obsolescence." Write or call Kearney & Trecker Corporation, 6784 W. National Ave., Milwaukee 14, Wisconsin. Telephone: GReenfield 6-8300.
TOOL-LEASE PROGRAM
The Critical Picture of Creeping Obsolescence

Story of a Reliefer that became the No. 1 Starter

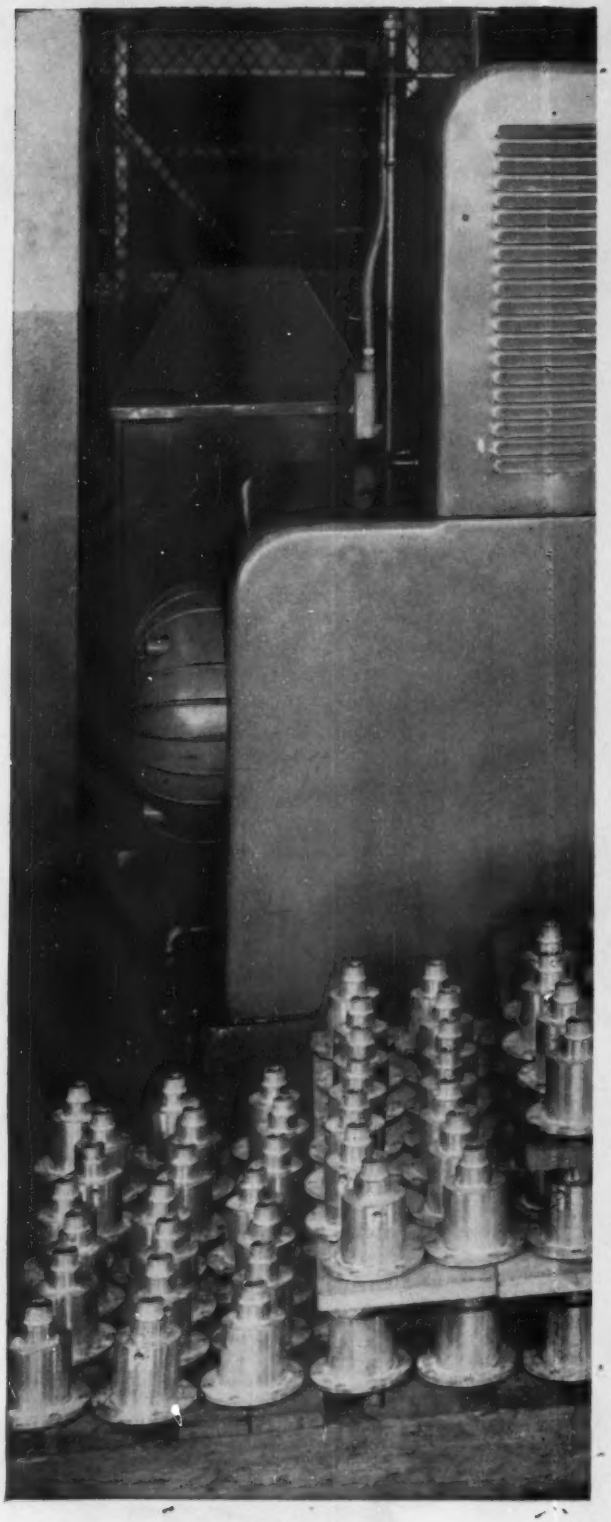
IT CAN HAPPEN with machines as well as men. Ask the Powers Regulator Company of Skokie, Illinois—manufacturer of automatic temperature and humidity control systems.

Powers Regulator, like many companies, was faced with the necessity of increasing production of a battery of turret lathes, some of which needed replacement. They also wanted to call in some of their subcontracted work. So they bought a Warner & Swasey 1 AC Single Spindle Automatic to help take the pressure off their hand-operated machines.

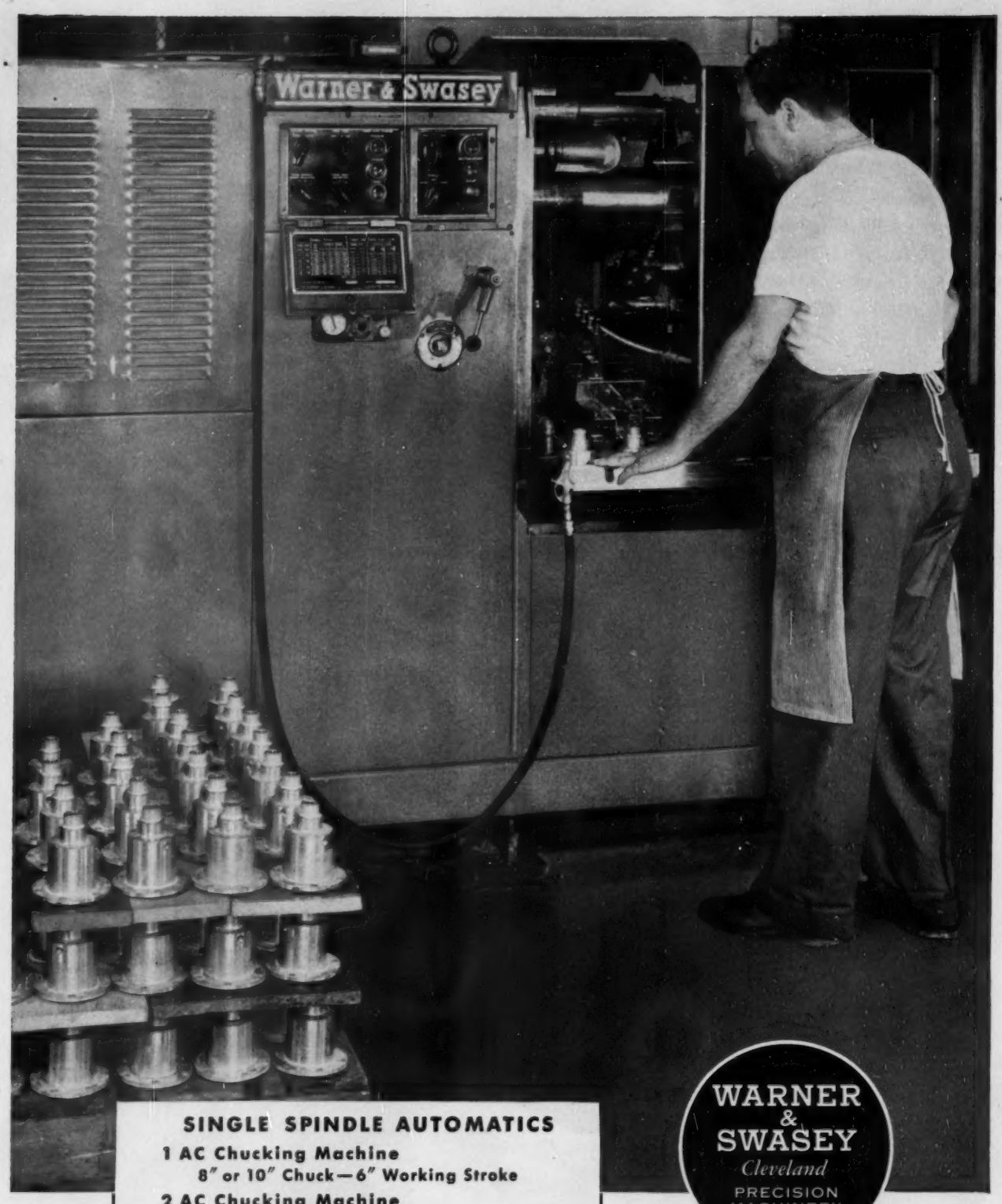
This company soon discovered that they had never fully realized the tremendous work potential of the 1 AC. It kept taking over more and more turret lathe work—increasing the production on some of the more complex pieces as much as three times. So the company scheduled the 1 AC for additional shifts—still more work.

The machine really did the job cut out for it! It eased the load on the turret lathes, and the company recovered work previously subcontracted. It performed so well, in fact, that Powers Regulator has since added a second 1 AC.

This story is not unusual. The 1 AC's quick setup and extreme accuracy make it ideal for increasing production on many turret lathe jobs—while requiring less skilled operators. And its advantages as an automatic cuts costs on short and long run jobs. But find out how the 1 AC will boost profits in your plant—call in our nearest Field Engineer for all the facts.



YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &



SINGLE SPINDLE AUTOMATICS

1 AC Chucking Machine
8″ or 10″ Chuck—6″ Working Stroke

2 AC Chucking Machine
10″ or 12″ Chuck—9″ Working Stroke

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

New "Magic

Speeds Up Service to You through your MORSE-FRANCHISED DISTRIBUTOR

Touch"

Now there's a telegraph office right in the Morse plant! And it can reach, within minutes, any other telegraph office in the country . . . through a new electronically controlled automatic switching system. This is the first installation of its kind in the cutting tool industry . . . one of the first in the world.

And this ultra-modern system has been installed with exactly one idea in mind . . . to enable your Morse-Franchised Distributor to give you faster service than ever on the finest cutting tools made . . . Morse Drills, Taps, Dies and Die Sets, Reamers, End Mills, Counterbores and Milling Cutters. Call him on any cutting-tool problem . . . he has what you need or he can get it, *right now!*

MORSE TWIST DRILL & MACHINE COMPANY

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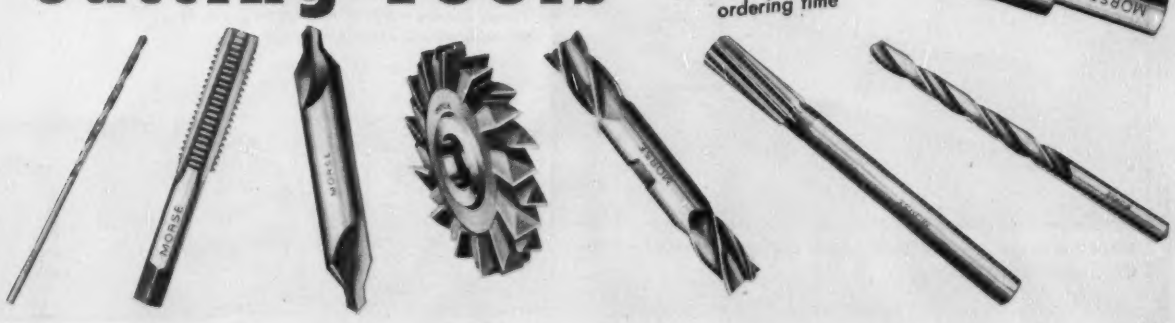
MORSE

Cutting Tools

Buy them by phone from your Morse Franchised Distributor and save ordering time



Only accurate forming

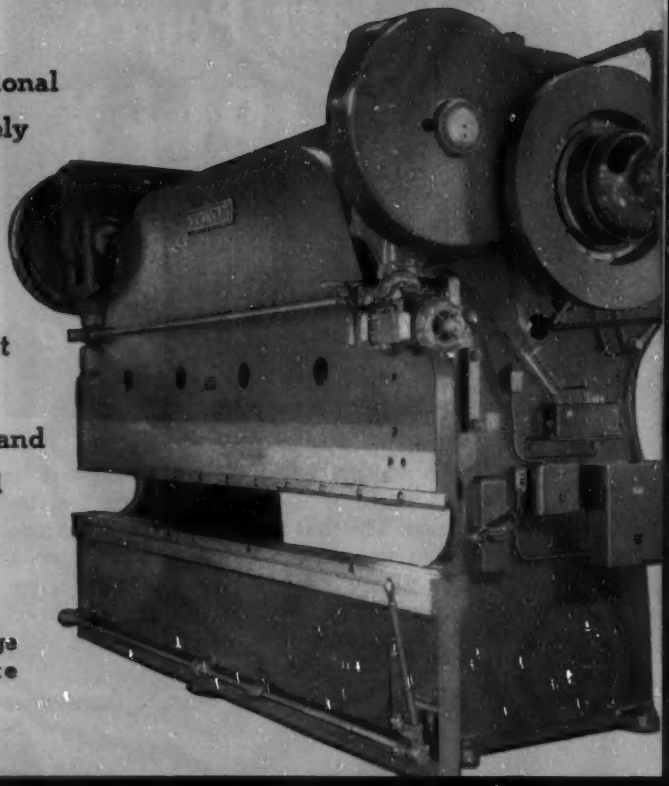
Photos courtesy of E. O. Bulman Mfg. Co., Inc., Grand Rapids 2, Michigan.

Note the clean straight lines of the moldings formed on the Cincinnati Press Brake.

...could solve this problem

The long steel shelves of these sectional display racks are formed so accurately that sections match perfectly with lines straight and clean.

The Cincinnati Press Brake is forming to such close tolerances that a masking strip previously used is eliminated. A production increase and no discards has materially reduced costs while product was improved.



Write for the New 72-Page Cincinnati Press Brake Catalog.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

CINCINNATI

Bottoms Up... Down... Sideways

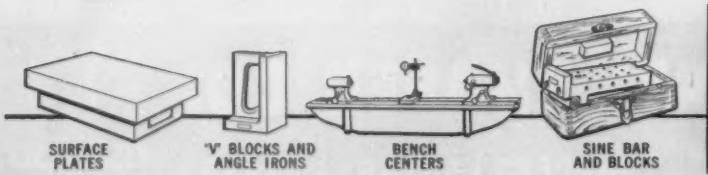
New Taft-Peirce MULTIPLEX ANGLE IRON

Cuts Your Set-Up Time

Here's another new Taft-Peirce shortcut to faster, easier setups for machining and inspection. The first real development in angle irons in several decades. ALL surfaces on a MULTIPLEX Angle Iron are scraped accurately flat . . . square within .0005″ in 6″ length . . . and parallel to opposite sides within .0005″ tolerance.

Note the inside right angular faces *meet*, unlike old style angle irons. Made of high quality cast iron, properly normalized and aged, base and angle sections are ribbed for rigidity. A valuable time-saver on boring mills, planers, and drill presses too, Multiplex angle irons frequently reduce multiple machining operations to only *one* setup.

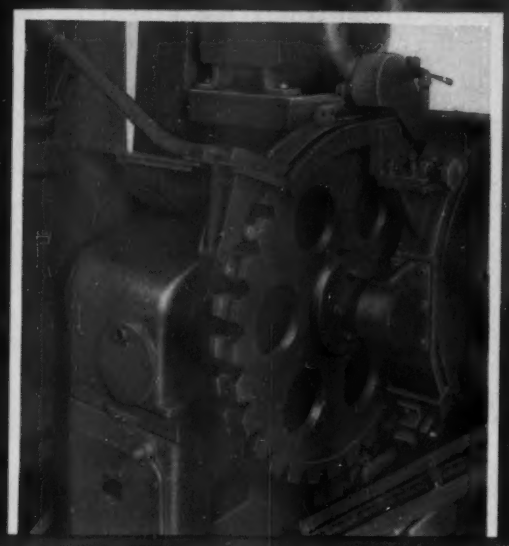
Now stocked in 12″ x 12″ x 12″ size. Plain working surface (without holes or slots) measures 9″ x 12″. Approximate weight is 95 pounds. For more information on these and hundreds of other Taft-Peirce Toolroom Specialties send for your copy of the Taft-Peirce Handbook.



T-P means Top Precision

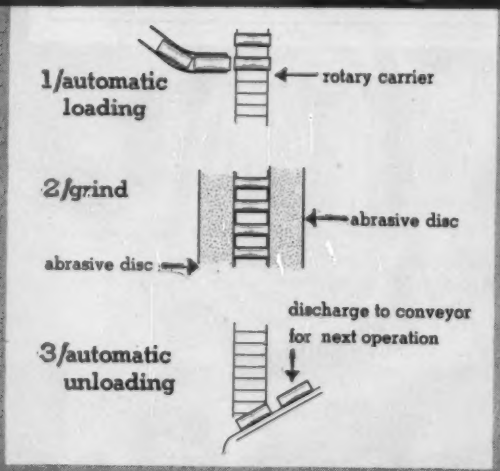
T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.



Gardner No. 125-26" Double Spindle Grinder

Automatic Operation Gives Grinding Output of 1800 Pieces per Hour



TWO parallel ends ground in ONE operation

work data	
PART	Piston pin 3.026" long x .980" O.D. x .722" I.D
PRODUCTION	1800 per hour.
STOCK REMOVAL	.020" overall.
TOLERANCES	.0015" for parallelism; .0025" for uniformity.
ABRASIVES	2 Gardner Yellow Rim Wire-Lokt Discs.
TOOLING	Vee-notched rotary work carrier with hopper feeder and automatic unloading to conveyor.

GARDNER MACHINE COMPANY
410 Gardner St., Beloit, Wisconsin, U. S. A.

GARDNER

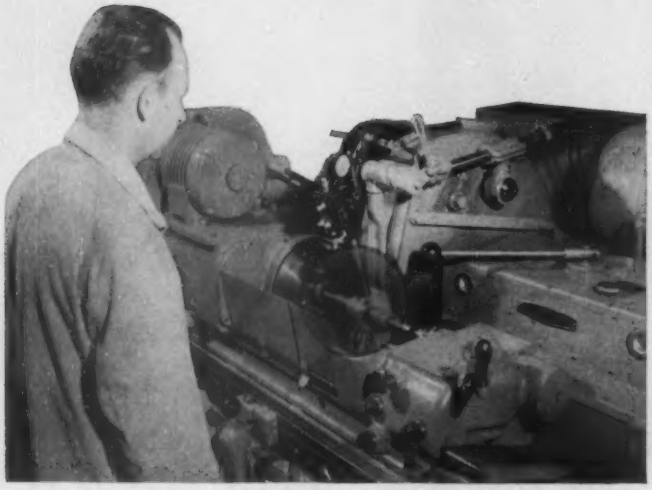
precision disc grinders

131M

More proof of how

Norton G Bond wheels boost O.D. grinding profits

Users praise "TOUCH of GOLD" *performance that steps up production rate and quality while cutting costs*



Cylindrical Grinding is faster, easier, more profitable when wheels made with the Norton G Bond — most efficient vitrified bond ever developed — add the "Touch of Gold."

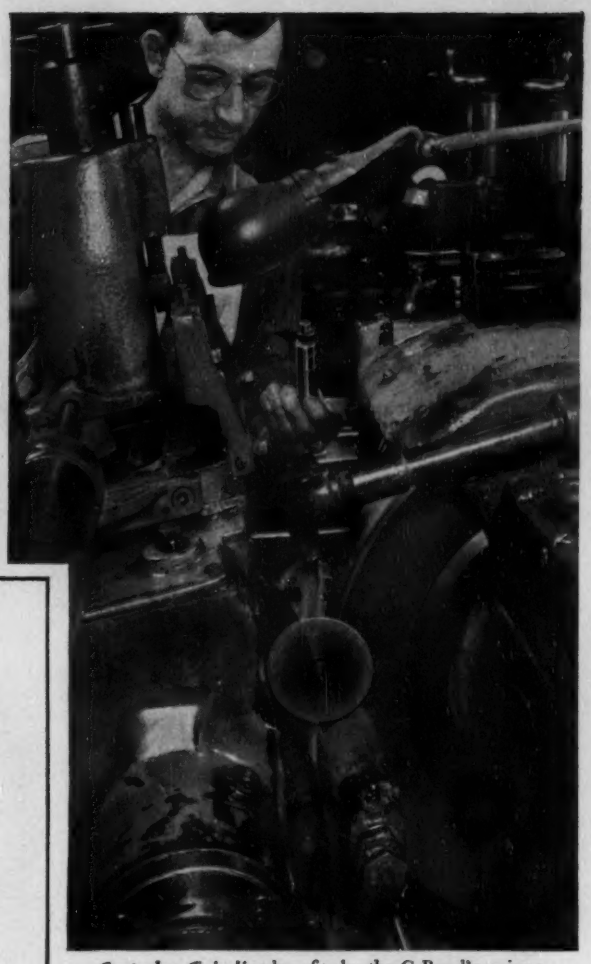
Users' Reports on Cylindrical Grinding

Job: Assorted small diameter stock.
Report: G Bond wheel gave 50% more pieces per dressing, with greatly improved finish.

Job: Rear axle pinions, SAE 4120 stock.
Report: Grinding to .001" limits, G Bond wheels removed stock faster, more uniformly. Gave more pieces per dress, with less spark-out time.

Job: 3" diameter formed roll, hard steel.
Report: Cooler cutting, crush-trues nicely, holds form. Best wheel ever used.

Job: Hardened steel raceways of ball bearing "inners."
Report: Ground 60 of the .075" radius grooves per dressing, compared to 25 with previous wheel. This G Bond wheel, also used on critical shoulder job, held form and gave superior finish.



Centerless Grinding benefits by the G Bond's unique ability to hold each abrasive grain just long enough for maximum cutting action — an important "Touch of Gold" advantage.

Users' Reports on Centerless Grinding

Job: ¾" diameter x 2" textile spindles, spindle steel.
Report: G Bond wheels produced better form and finish than any other wheels. Gave 50% more pieces per dressing on both rough and finish grinds. Also eliminated previous distortion of spindles due to overheating.

Job: Removing up to .010" per pass on varied steel parts.
Report: Dressing required only once every 4 hours, instead of every 40 minutes. Best general purpose wheel ever used on our centerless machines.

Job: Thru-feed ½" diameter bar stock, stainless steel.
Report: Cut faster and freer, held size better and gave better finish than previous standard wheel.

Job: ½" diameter shafting, drill rod and stainless steel.
Report: G Bond wheel gave 16 hours longer wheel life and produced much better finish.

In O.D. grinding, as in many other precision and semi-precision grinding operations, first-time users of G Bond wheels are quick to recognize that here, at last, are wheels that will outperform any others they ever used. Advantages like these are the reasons why:

Cooler cutting action . . . faster stock removal . . . better finish . . . more pieces per dressing . . . longer wheel life . . . easier dressing, with less wear on diamond or on crushing roll.

Added up, all these new advantages mean valuable production economies and improvements in your product. That's why G Bond users have been glad to show their appreciation — with a steady stream of endorsements like those reproduced here.

Your Norton Distributor

is ready with proof of how G Bond wheels can add the work-speeding, profit-increasing "Touch of Gold" to your own cylindrical or centerless grinding jobs. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your classified 'phone directory. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass. W-1575

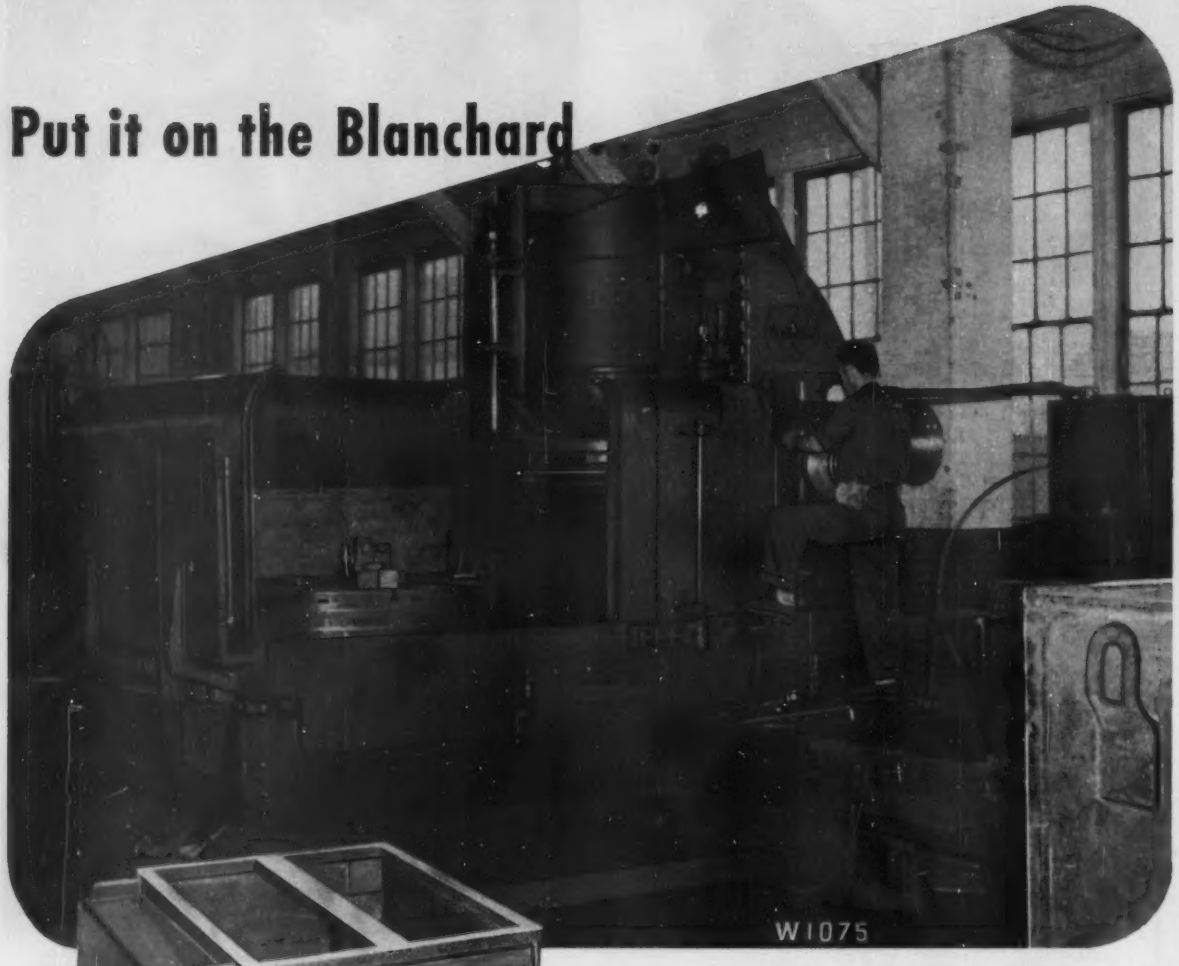
Making better products . . . to make other products better

NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

Put it on the Blanchard



it takes 1/5th the time!

Here is another example of the special jobs Blanchard Surface Grinders perform *in less time*, to exacting specifications.

These explosion-proof control cases are used in the coal mining industry. Each steel weldment case is 36" x 48" x 24" deep. Because gaskets cannot be used, surface finish, and flatness must provide a dust and gas explosion-proof metal seal.

A Blanchard Surface Grinder, the No. 32-60, removes approximately ⅛" of stock — in *one-fifth* the machining time formerly required.

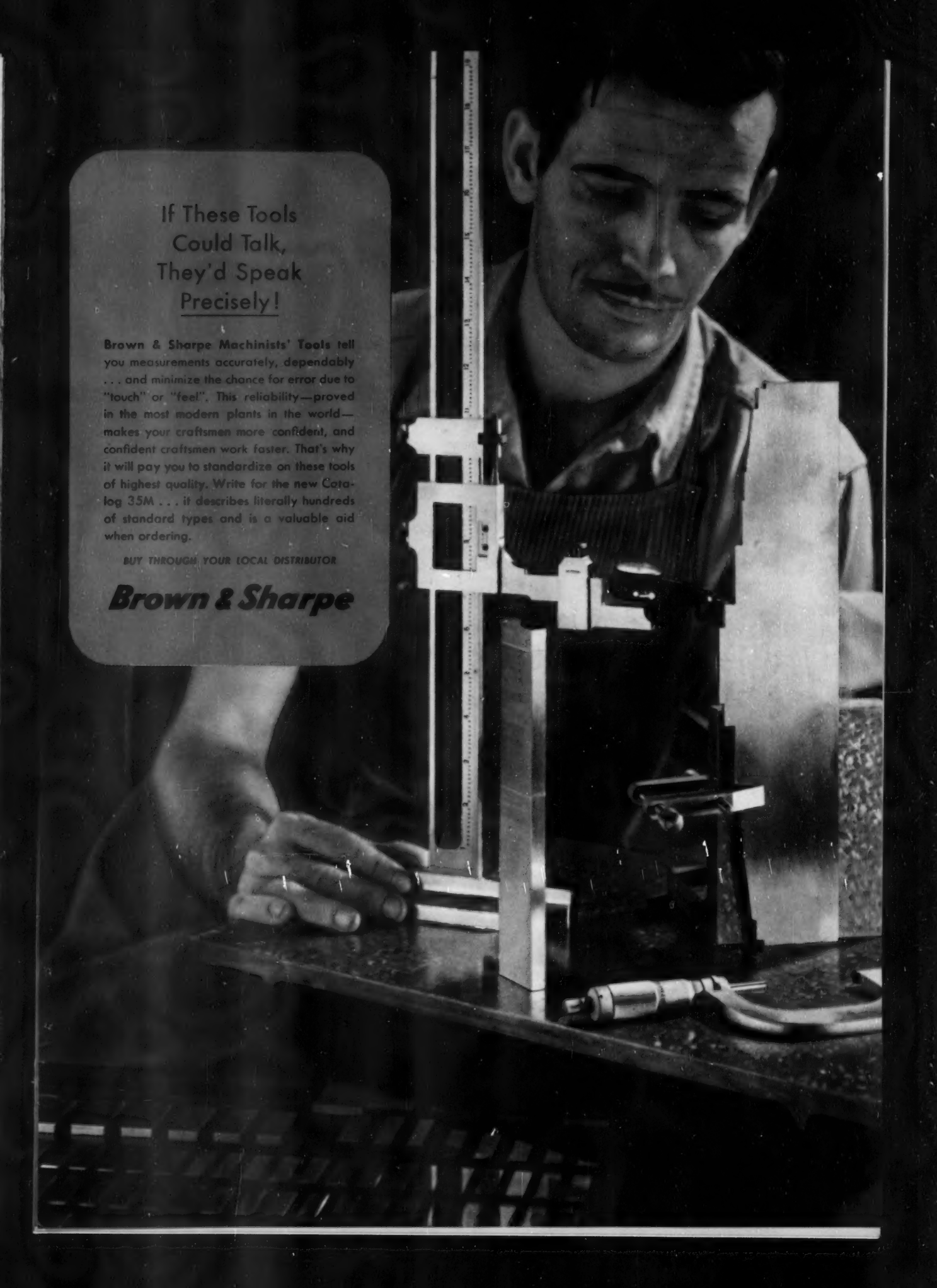
Send a sampling of your parts for free test grinding and our recommendations.

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.


If These Tools
Could Talk,
They'd Speak
Precisely!
Brown & Sharpe Machinists' Tools tell you measurements accurately, dependably . . . and minimize the chance for error due to "touch" or "feel". This reliability—proved in the most modern plants in the world—makes your craftsmen more confident, and confident craftsmen work faster. That's why it will pay you to standardize on these tools of highest quality. Write for the new Catalog 35M . . . it describes literally hundreds of standard types and is a valuable aid when ordering.
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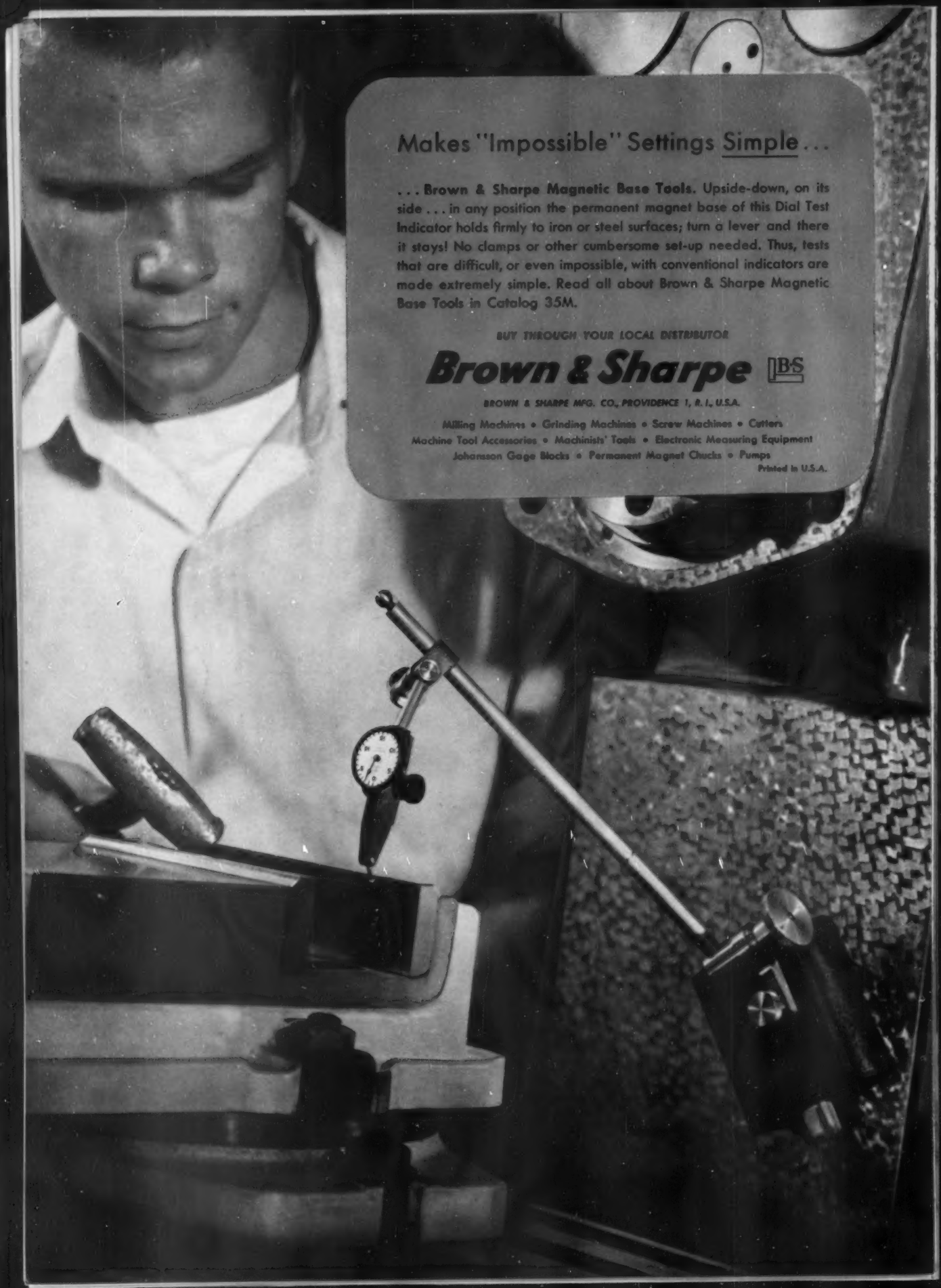
Makes "Impossible" Settings Simple...
... Brown & Sharpe Magnetic Base Tools. Upside-down, on its side ... in any position the permanent magnet base of this Dial Test Indicator holds firmly to iron or steel surfaces; turn a lever and there it stays! No clamps or other cumbersome set-up needed. Thus, tests that are difficult, or even impossible, with conventional indicators are made extremely simple. Read all about Brown & Sharpe Magnetic Base Tools in Catalog 35M.
BUY THROUGH YOUR LOCAL DISTRIBUTOR
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BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.
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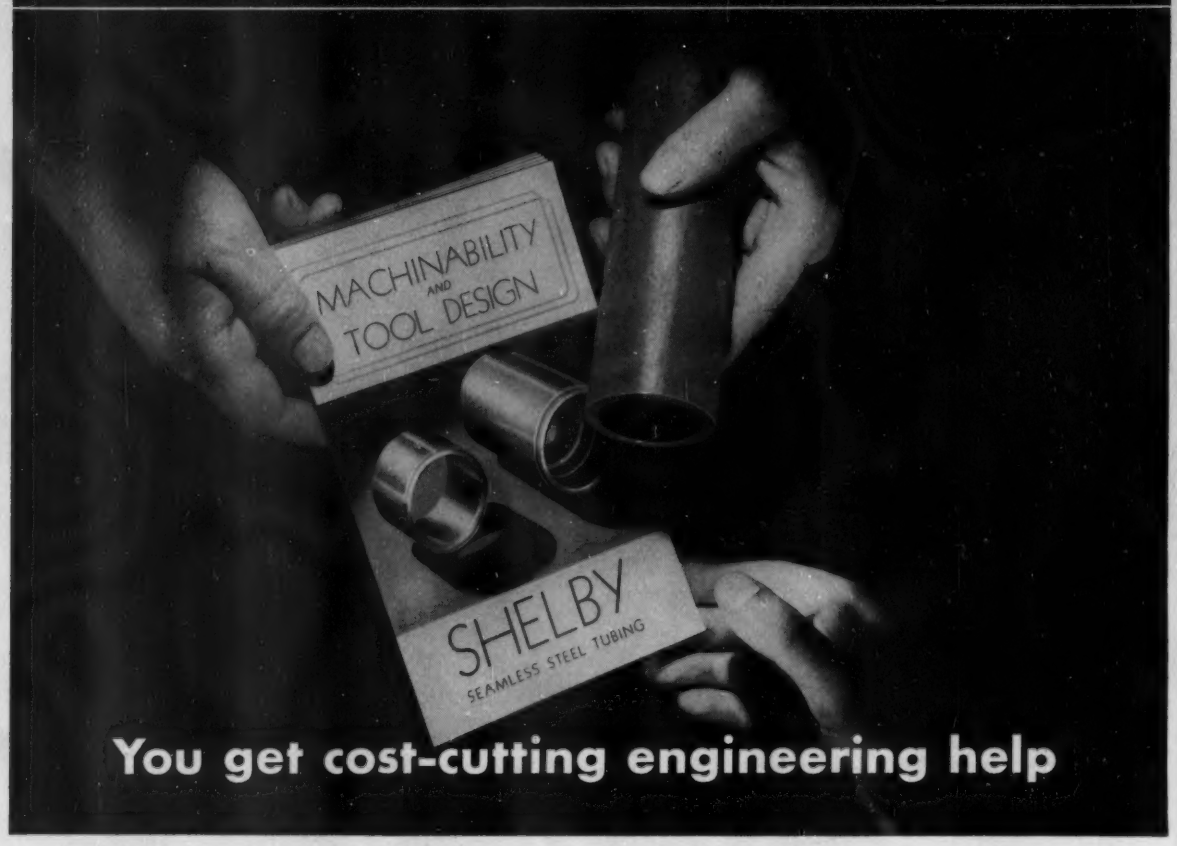
Machine Tool Accessories • Machinists' Tools • Electronic Measuring Equipment
Johansson Gage Blocks • Permanent Magnet Chucks • Pumps
Printed in U.S.A.

WHY IT PAYS TO BUY MECHANICAL TUBING FROM US



You get cost-cutting engineering help

● Our wide experience with all types of tubing problems has saved a lot of money for a lot of our customers. For example, we can often find a less costly type of tubing that will do a job as well or even better than a type that might cost more, but would not be "best" in that particular application.

You too may benefit from our accumulated "know-how." For no matter what type or size job you have, you can always depend upon us for thorough, up-to-date technical assistance.

And our more-than-complete tubing stocks—we carry 531 sizes of Shelby Seamless Tubing—means that you will get fast delivery of exactly the type you want. It's all top quality tubing too . . . manufactured by the National Tube Division of United States Steel.

So let *us* carry the costly, cumbersome tubing inventory that can meet your every requirement . . . competently, quickly. Call us when you need: mechanical tubing, round and square, seamless and welded; boiler tubing, pressure tubing and pipe; stainless steel tubing, seamless and welded, and stainless pipe.

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UNITED STATES STEEL

UNITED STATES STEEL

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You'll get from your Taps the *accuracy* and *long life* that Winter has designed and built into them.

So of Course

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BALANCED Action

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PRECISION CHIP DRIVER CONTOURS

ACCURATE AND CONCENTRIC CHAMFERS

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

National

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IT'S THE EDGE

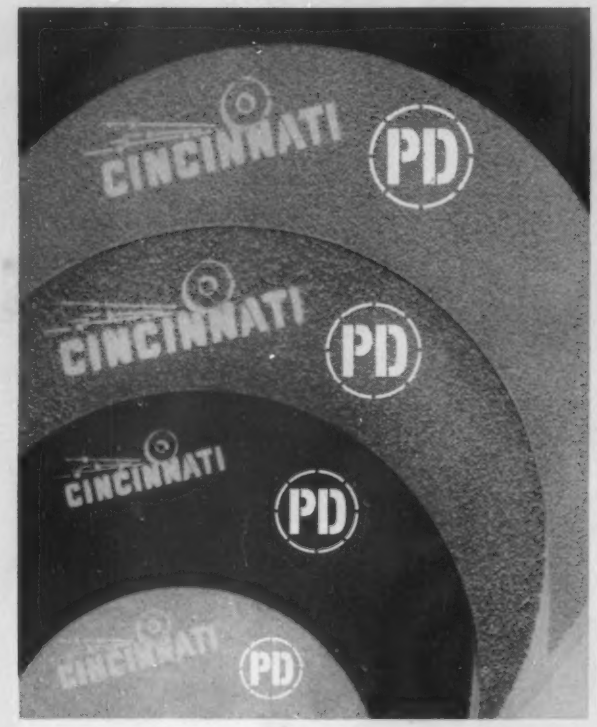
that determines your cost-per-drilled-hole

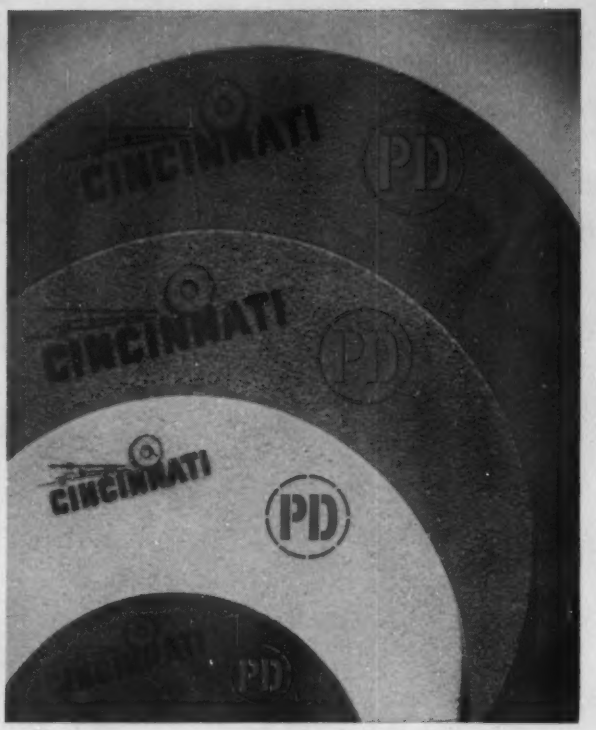
To remove metal at lowest cost use *carefully designed and manufactured* cutting tools. National gives you the edge!

NATIONAL TWIST DRILL AND TOOL COMPANY

Rochester, Michigan, U.S.A. Distributors in principal cities. Factory branches: New York • Detroit • Chicago • Dallas • San Francisco • Los Angeles

Greatest Grinding Wheel Development in Years





NOW!

Cincinnati Grinding Wheels offer

PD POSITIVE DUPLICATION

Without a doubt the new CINCINNATI (PD) Manufacturing Process is the most important grinding wheel development in years. It is an achievement in precision manufacturing and quality control that will save you money and increase your production. Here's why:

Through the CINCINNATI (PD) Manufacturing Process, you can be positive that every CINCINNATI (PD) Wheel you order will be produced exactly to the Cincinnati grading specified for your job.

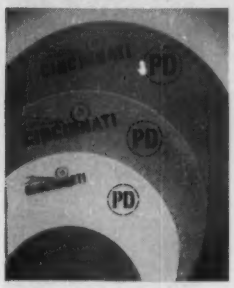
Just as a negative guarantees exact duplication of a photograph, the CINCINNATI (PD) Manufacturing Process assures a POSITIVE DUPLICATION of the original wheel EVERY time you reorder.

The problem of duplication has been a major concern of Cincinnati Milling throughout its 30 years of experience in using grinding wheels, and in supplying industry with precision grinding machines equipped with grinding wheels and ready for production opera-

tion. Cincinnati Milling found that once the right wheel had been specified for a job, it was frequently difficult to secure additional wheels of identical grading that would duplicate the performance of the first wheel. The need for positive duplication is of utmost importance not only to Cincinnati Milling, but to every user of grinding wheels.

Positive Duplication (PD) is the result of extensive manufacturing research which revealed that *several steps* in the production of grinding wheels generally considered as unimportant, were, quite to the contrary, *extremely important.*

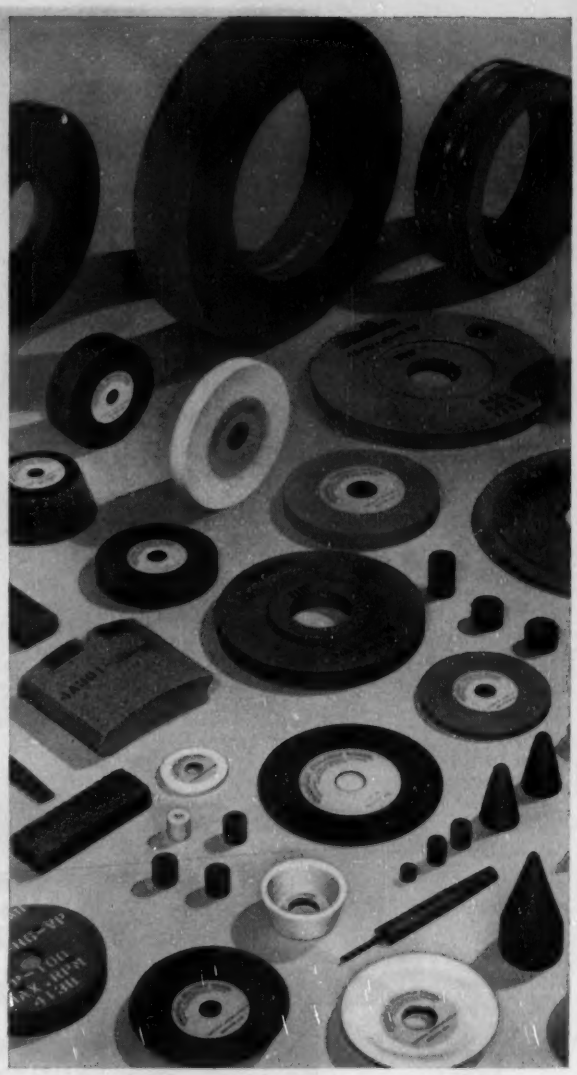
As one step toward (PD) wheels, Cincinnati Milling constructed the world's most modern grinding wheel plant. Some of the equipment installed has never before been used by the industry in the manufacture of grinding wheels.



Then, to make (PD) wheels an actuality, Cincinnati Milling developed new standards of manufacture with 36 quality control steps. From the weighing of the grain and bonding material, through molding, drying, firing, finishing, to final inspection, every operation is carried out with the same exactness as in building a precision machine tool.

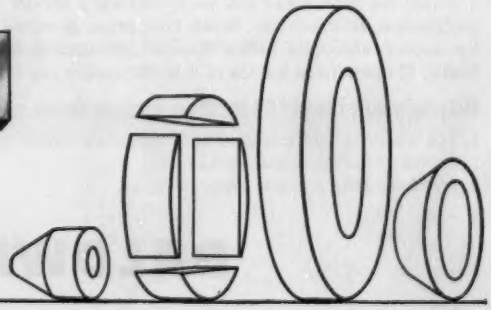
You're assured a POSITIVE DUPLICATION of the original wheel EVERY time you reorder. "On grade" with a CINCINNATI (PD) Wheel means all future (PD) wheels will act and grind exactly alike. For you. this means *no more* production interruptions which cut output and increase your costs.

Let us prove to you how CINCINNATI (PD) Wheels will make money for you. Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire, or 'phone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.



CINCINNATI (PD) Precision and Snagging Wheels are available in vitrified and resinoid bonds in a complete variety of sizes and shapes.

CINCINNATI
Grinding Wheels
THE CINCINNATI MILLING MACHINE CO.
Cincinnati 9, Ohio



with 7 positive design advantages for compacting powdered metals

To meet the urgent needs of the rapidly growing powdered metals industry, Baldwin press-development engineers created the Model "C" Compacting Press. Every design feature of the Model "C" is specifically employed for the special requirements of powdered metallurgy.

Rated for pressure of 100 tons, Baldwin's Model "C" is a mechanical, four column, crank type press, powered by a 20 hp. motor, equipped with a flywheel, pneumatic clutch and brake. It operates at speeds of 4 to 24 strokes per minute.

Only Baldwin's Model "C" has these 7 unique design advantages:

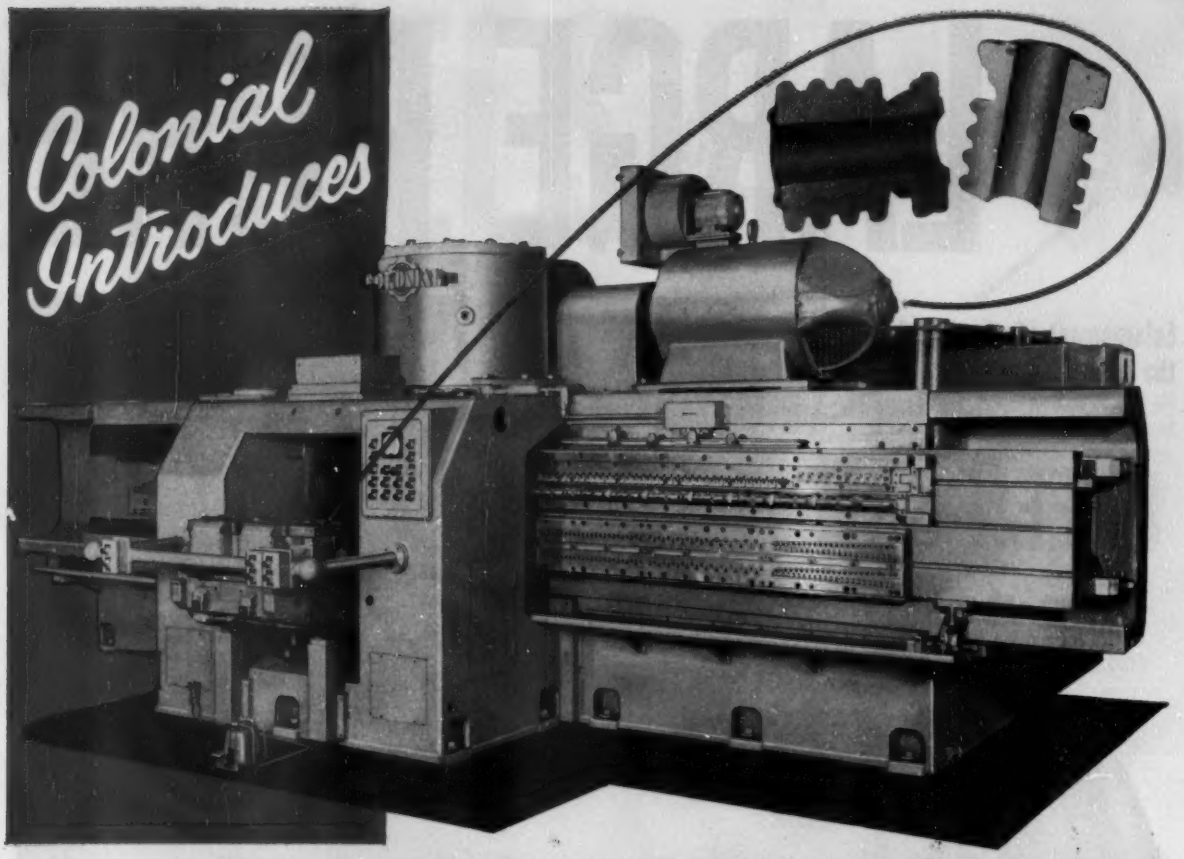
1. The motor is fully enclosed and completely sealed to prevent entrance of abrasive materials . . .
2. Hydraulic head prevents overloading . . .
3. Floating die holder and core rod float independently with adjustable die stops . . .
4. Fill adjustment of zero to 6 inches means no cams to change . . .
5. Shuttle type feeder covers die before bottom punch retracts . . .
6. Automatic pressure lubrication—oil is pumped through drilled crank shaft . . .
7. Cycling—the Model "C" has *five* different cycling setups . . .

Only the Baldwin Model "C" Compacting Press can solve every *pressing* problem for the powdered metals industry. To learn how it can work for *you* send for the new booklet specially prepared to give you a detailed description and specifications of the Model "C." Write to Department 4602, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pennsylvania.

BALDWIN · BLH · LIMA-HAMILTON

BALDWIN-LIMA-HAMILTON

Philadelphia 42, Pa. • Offices in Principal Cities



the MECHANICAL HORIZONTAL

for faster broaching of surfaces

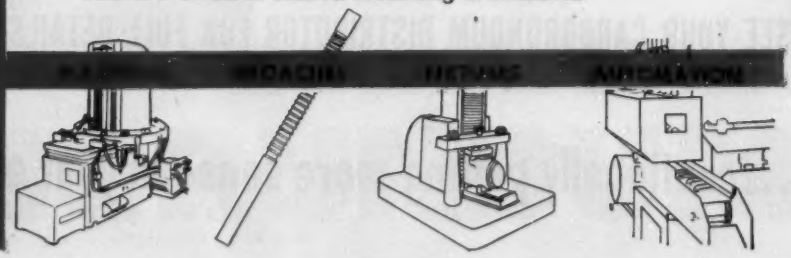
The model HM-25-130, is the first in a new line of Colonial MECHANICAL HORIZONTALS. It removes 3½ pounds of metal, with depth of cut varying from 5/32 to 3/16 of an inch, in a 21-second broaching cycle from two cast iron bearing cap clusters. Tungsten carbide-tipped tool bits mounted on the 24" wide ram, travel at more than 140 feet per minute. The machine broaches on both the forward and return strokes, doubling the length of cutting action as compared to ordinary broaching. The machine has a 130-inch stroke and 25-ton capacity. Broaching speed is variable (30 to 150 sfm) through rheostat control of the direct current 150 hp motor.

Trunnion-type fixture has hydraulic clamping, positioning, and shuttling. All automatic cycle hydraulic and electrical controls are interlocked, and this equipment is installed according to J.I.C. standards. Table level loading of work and floor level accessibility of the broach inserts and practically all operating parts are important features of the machine. Floor space is 194 x 290 inches.

This is a Colonial Unified Broaching Installation.

Unified Broaching

COLONIAL



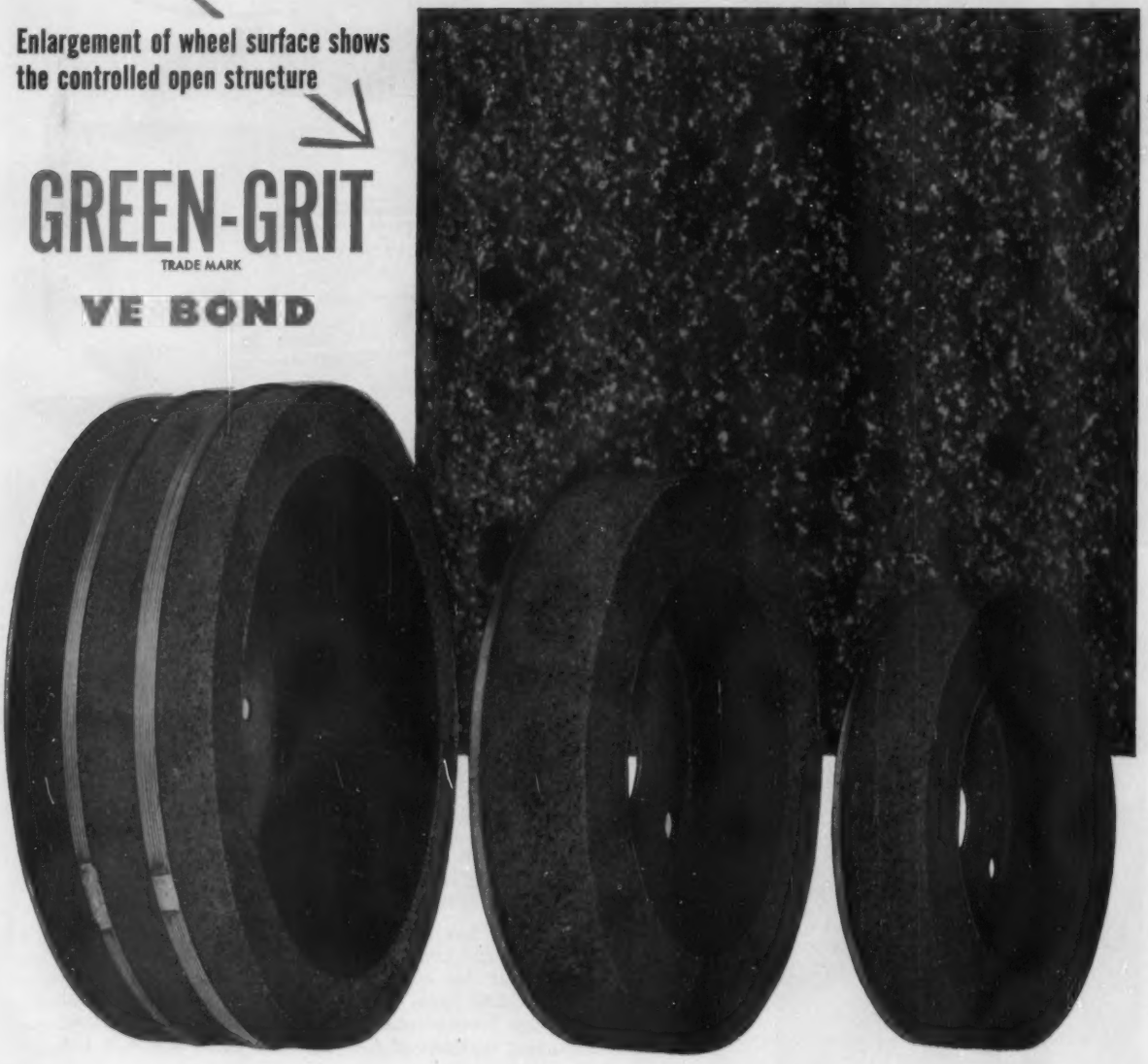
NEW LARGE PORE

Enlargement of wheel surface shows the controlled open structure

GREEN-GRIT

TRADE MARK

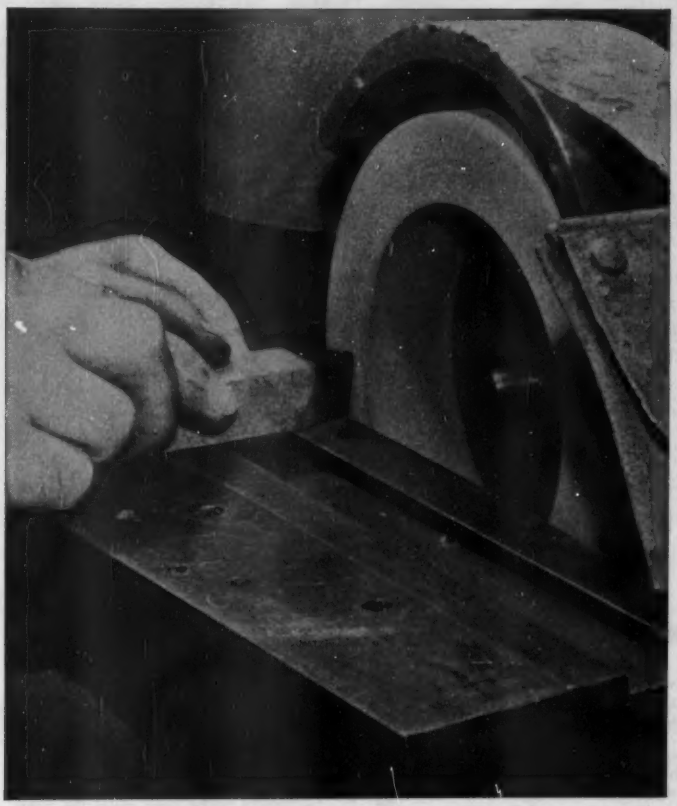
VE BOND



SEE YOUR CARBORUNDUM DISTRIBUTOR FOR FULL DETAILS He's listed in the yellow pages under "Abrasives" or "Grinding Wheels"

...continually putting more sense in your abrasive dollar

WHEELS for carbide grinding



Cool, fast cutting—plus long wheel life: these are the features most liked by users of CARBORUNDUM's new series of GREEN-GRIT open-pore 12 Structure VE Bond Wheels for grinding of cemented carbides. Here are some typical comments.

"**Less heat is right!** These new wheels surprised us on that score. We rough our tools faster, get more tools per wheel—and have eliminated heating and checking of tools."

"**We find we can grind all types** of carbide with one grading of your new GREEN-GRIT Wheel. What's more, we use them right down to the steel backs—that new cement does the trick!"

"**Glazes less** than any other wheel we have tried. The open pores provide better chip clearance, as well as cooler cutting qualities."

"**We use one grade softer** with your new wheel...get faster cutting and still get longer life."

GREEN-GRIT large pore wheels are available in a complete range of grits and grades. Why not order one for trial today?

Send for this

FREE BOOKLET

on carbide grinding ... plus folder on new GREEN-GRIT Wheels.

THE CARBORUNDUM COMPANY
Niagara Falls, New York, Dept. AM 81-411

"I'd like your booklet, *"Grinding Cemented Carbides"* and the folder on your new open structure wheels.

NAME _____ TITLE _____

COMPANY _____

STREET AND NUMBER _____

CITY _____ ZONE _____ STATE _____

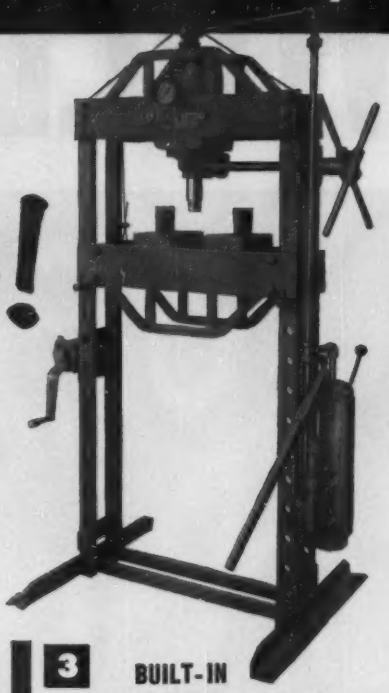
CARBORUNDUM

REGISTERED TRADE MARK

81-411

KRW is the Best Hydraulic Press You Can Buy!

Let's take one apart and prove it!

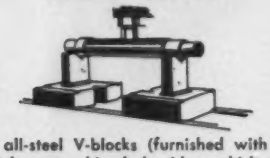


KRW Customers, which includes almost every nationally known company in the United States and Canada, tell us that KRW Presses are the best buy! They have proved it to themselves in day after day, year after year satisfactory performance. Now we want to prove to you why these customers are so right.

1 RAPID APPROACH OF RAM FILLS CYLINDER WITH OIL

The ram is quickly brought down to the work by rotating the "Capstan" handwheel. As the ram descends to the work the cylinder is automatically filled with oil. A flip of the ball arm closes the valve, and the first pumping stroke gives tons of pressure on the work.

2 MACHINED ALL-STEEL V-BLOCKS



KRW all-steel V-blocks (furnished with the press) have machined shoulders which slide on the machined top surfaces of the bed members. This means you can slide the V-blocks along the bed to make quick setups and they're always in alignment. You get solid, rigid, accurate support. No danger of V-blocks tipping or falling between the bed members.

3 BUILT-IN MECHANICAL PRESS

Spinning the "Capstan" handwheel rotates a pinion which engages a rack cut in the ram. The sliding handles in the handwheel can be extended to increase leverage to give a ram pressure of 3 tons. This "built-in" mechanical arbor press gives the operator the advantage of the large bed and its adjustability. It permits the use of the V-blocks when necessary. If more than 3 tons pressure is required close the valve and a few pumping strokes give the needed hydraulic pressure without moving the work from the bed.

4 WELDED TRUSS REINFORCEMENT

The heavy steel bed and crown plates on KRW presses have a special welded truss reinforcement to give them added strength and rigidity with minimum weight. This feature minimizes deflection.

5 CONVENIENT LOCATION OF HYDRAULIC PUMP HANDLE

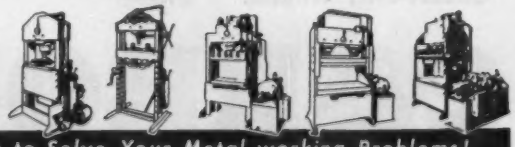
The KRW pump handle is slightly below waist level, a natural, comfortable position which enables the operator to work for long periods of time without fatigue. He can exert whatever strength necessary easily and efficiently. It's a man-saving feature that results in better, more accurate work and greater production.

COMPLETE LINE

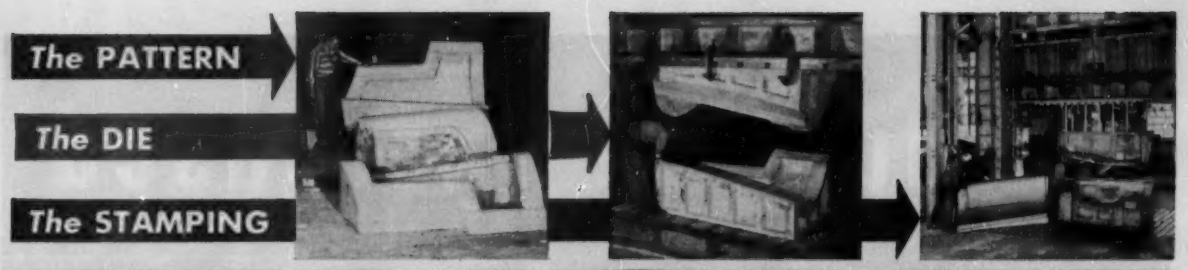
KRW makes a complete line of one, two and three cylinder Hydraulic presses, 25 to 150 ton capacities; hand operated, air operated or motor driven. Tell us your needs. We'll send you facts, specifications and prices without obligation.

K·R·WILSON

210 Mill Street, Arcade, N. Y.



Designers and Builders of the Right Hydraulic Press to Solve Your Metal-working Problems!



. . . to Completely Finished PROTOTYPE PARTS

READY FOR ASSEMBLY

It's Allied that offers the *complete* service to provide you with die-made prototype parts.

Plaster patterns . . . low-cost, quickly-produced dies made of plastic or zinc alloy . . . stampings accurately drawn and formed on Allied presses . . . completed parts which have been hand trimmed, flanged, pierced and spot finished . . . are all produced by Allied.

Not only is full responsibility for such a prototype program centered at one source but many economies can be effected from which you as a customer can benefit. In the building of the dies, for example, combinations of plastic, zinc alloy or steel (all of which Allied supplies) give you the best and most economical tooling for your volume requirements. In the finishing processes, as one more example, the tools themselves are often used for flanging and other purposes—additional cost-saving and accuracy-assuring operations.

If you need sheet metal stampings for prototype assemblies, you should investigate Allied's all-inclusive service. A visit to our Plant 4 in Hillsdale, Michigan will convince you that here is a positive method of insuring an economical and rapid transition from prototype to high volume production. If a visit is not convenient, let us supply you with complete information.

Other Allied Products

SPECIAL COLD FORGED PARTS • STANDARD CAP SCREWS • HARDENED AND PRECISION GROUND PARTS • R-B INTERCHANGEABLE PUNCHES AND DIES

PRECISION • EXPERIENCE • DEPENDABILITY
ALLIED PRODUCTS CORPORATION

ALLIED PRODUCTS CORPORATION

DEPT. D-19 12605 BURT ROAD DETROIT 23, MICHIGAN

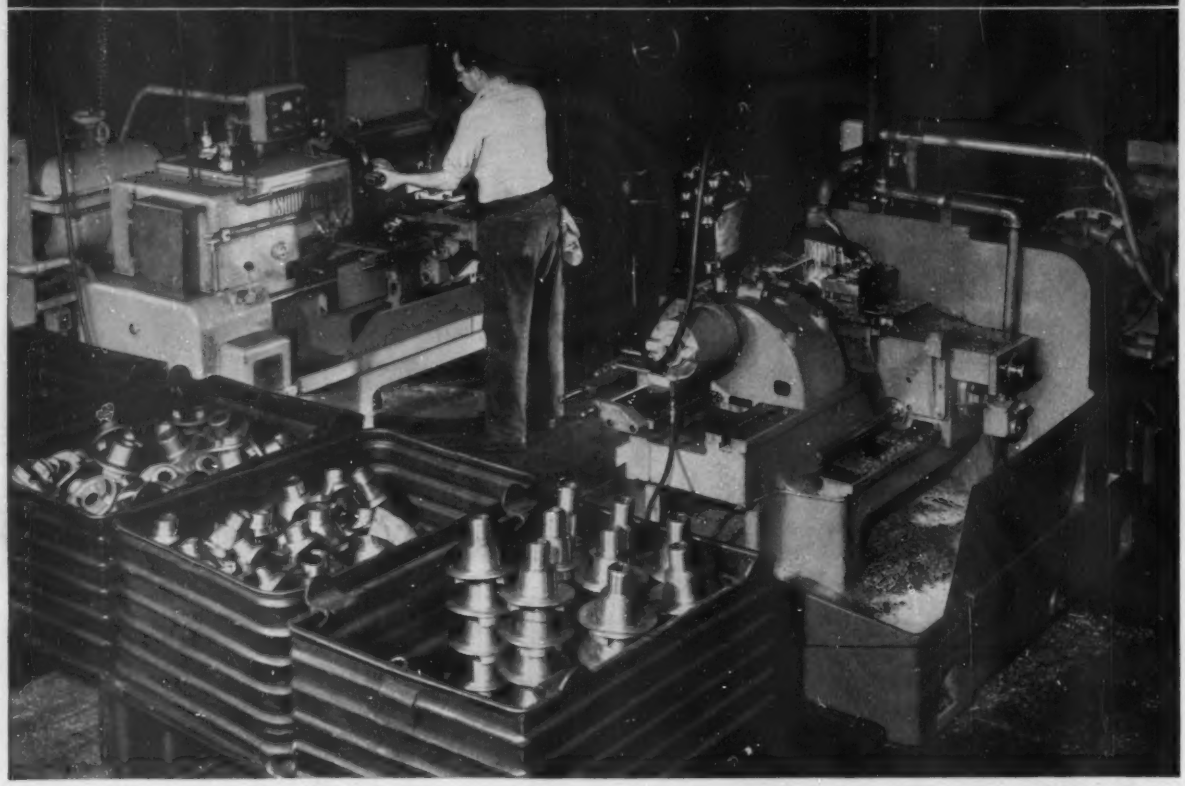
PLANT 1
Detroit, Mich.

PLANT 2
Detroit, Mich.

PLANT 3
Hillsdale, Mich.

PLANT 4
Hillsdale, Mich.

Production Increased



...with SUNDSTRAND Automatic Lathes

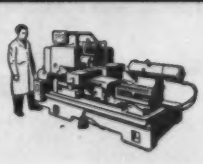
Two Sundstrand Model 8A Automatic Lathes are used for turning fitting yokes, slip yokes and weld yoke parts for the Mechanics Universal Joint Division, Borg-Warner Corp. of Rockford, Illinois. Use of these two Sundstrands has increased production over five times compared to former method. In addition to the production increase, tool life and finish has been improved.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

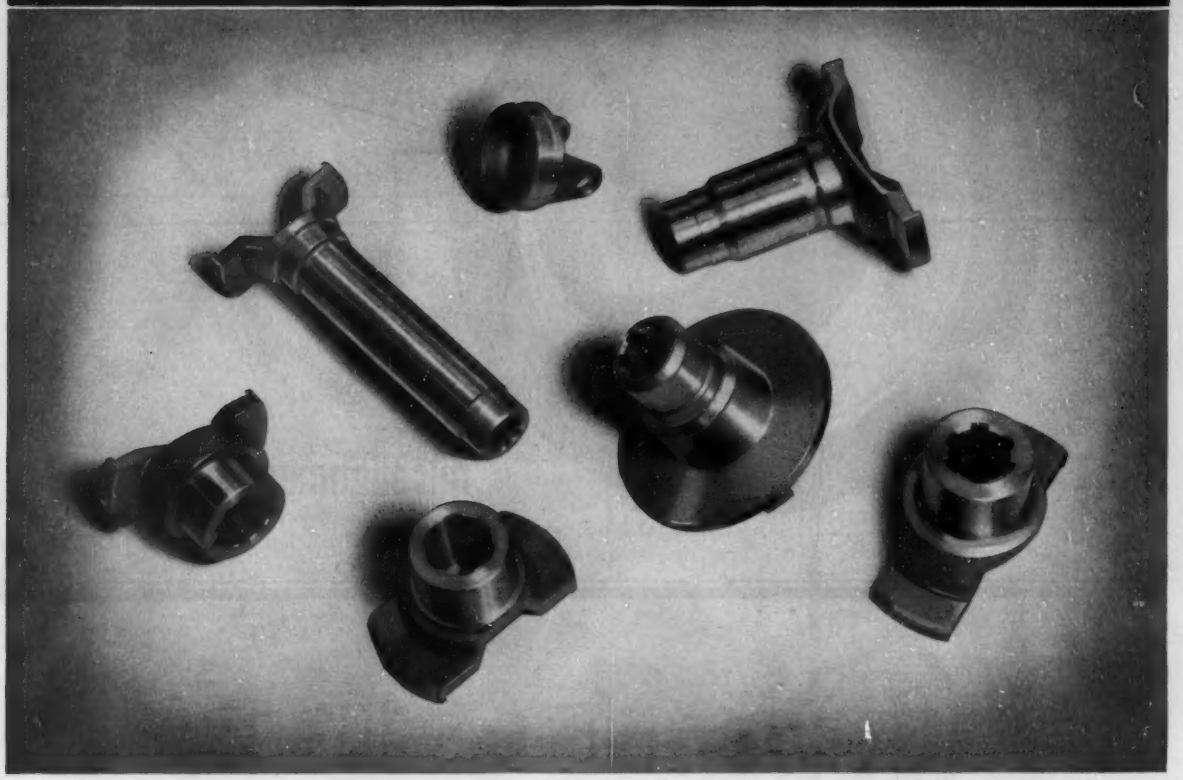
SUNDSTRAND

"Engineered Production" Service*

*REG. U.S. PAT. OFF.



More Than 5 Times



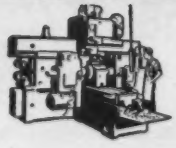
10 Different Jobs Turned In Lot Sizes of 500

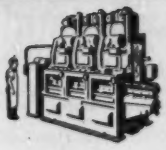
Operation for these yoke parts consists of turning the O. D. complete, using carbide tipped tools. Changeover time is *25% less* than with former method. One operator handles both machines. This is only one of many installations wherein Sundstrand Automatic Lathes have increased production. If you have turning operations, call in a Sundstrand engineer and get an "Engineered Production" analysis. There is no obligation for this service.

Additional Data

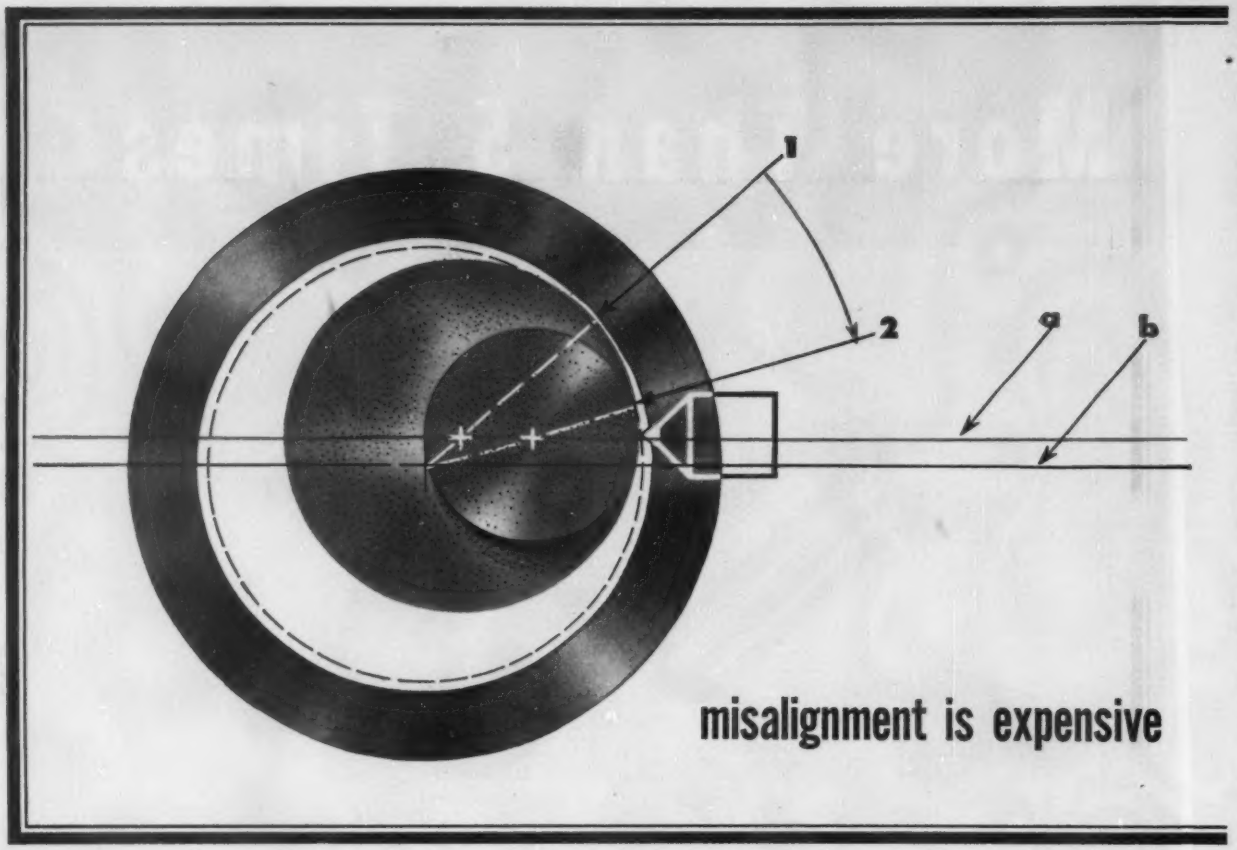
ADDITIONAL DATA on the complete line of Sundstrand Automatic Lathes is included in this new 32-page booklet. Write for your copy today. Ask for bulletin 146.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

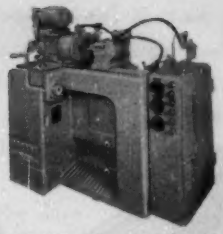


...Bryant controlled alignment

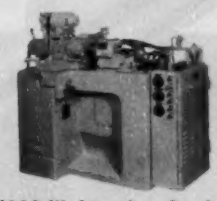
IF the internal grinder is to generate straight holes within precision tolerances, on a production basis, the various elements of the machine must be properly aligned. The axis of the work, the axis of the wheel, and the diamond must be in a plane parallel with both traverse and cross feed ways. Then the direction of feed will coincide with the line from the center of the workpiece to the point of contact between the wheel and the work, and the wheel will be dressed in line with its point of contact with the work regardless of the size of the wheel.

In the illustration above, these requirements are not met because the work center "b" is below plane "a" established by the wheel axis and the diamond. The drawing shows the wheel at its largest diameter (new) and also at its smallest diameter (worn). The difference between center heights "a" and "b" is constant during the life of the wheel. The position of the diamond remains constant for the life of the wheel. When the large wheel is dressed by the diamond it will contact the work at a point established

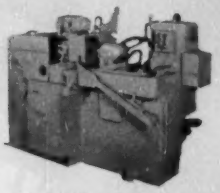
Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie—free showings arranged for engineering groups.



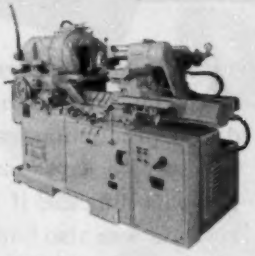
no. 1109 9" swing, semi-automatic



no. 1309-W 9" swing, 2 spindle semi-automatic

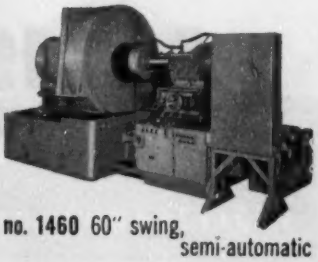


no. 2209 9" swing, automatic



no. 1116 16" swing, semi-automatic

no. 3216 16" swing, automatic



no. 1460 60" swing, semi-automatic

The Bryant 3216 Automatic Internal Grinder is designed specifically for high production precision grinding and with minimum operator attention. All machine motions are hydraulically actuated. The 16" swing permits grinding of straight and tapered holes in large diameter work to a maximum depth of 9". The workhead can be swiveled to grind tapers up to 60° included angle. The entire grinding cycle of rough grind, dress and finish grind proceeds automatically and operator attention is required only for loading and unloading of work pieces and starting the cycle. Write for folder.

gives better internal grinding

by a line from the center of the work through the center of the wheel (position 1). When diamond sizing, the work, or wheel, is fed to a predetermined position. As the wheel wears down, it will continue to contact the diamond at the same point during dressing, but the small wheel will contact the work at position 2 and the size of the finished hole will be substantially smaller.

As the wheel wears, the point of contact between wheel and work will move gradually from position 1 down to position 2, and the size of the finished hole will become progressively smaller. This is one of the reasons that some internal grinders, when set up for diamond sizing, will not hold size during the life of the wheel. Many operators attempt to compensate for this error by constantly adjusting the diamond. The correct remedy would be to bring the axis of the work, the axis of the wheel and the diamond all into a common plane parallel with both traverse and cross feed ways. Finish size will then be correct regardless of wheel diameter.

see our catalog in MACHINE TOOL CATALOGS or write for copy

Bryant Chucking Grinder Co.

Springfield, Vermont, U. S. A.

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

Rejects Eliminated

WHEN INDUCTION HARDENING REPLACED CARBURIZING

A LEADING AIRCRAFT BUILDER had a high reject rate while carburizing hydraulic control valves. In addition, production was slow. Rework after rework was necessary because material was brittle and straightening was difficult, if not impossible. Depth of carburization was also hard to control . . . and it was a dirty job, too!

Picture Changed Overnight

Now, with Allis-Chalmers induction heaters rejects or reworks are eliminated; depth of hardening is held between .078 inches and .080 inches; production is greatly increased; and it's a clean, pushbutton type job.

Where there's a problem with warpage, scaling, or heat control, even a relatively low production item can often be profitably processed using induction heat.

Bring your problems to Allis-Chalmers. Call your nearby A-C district office or write Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-4404

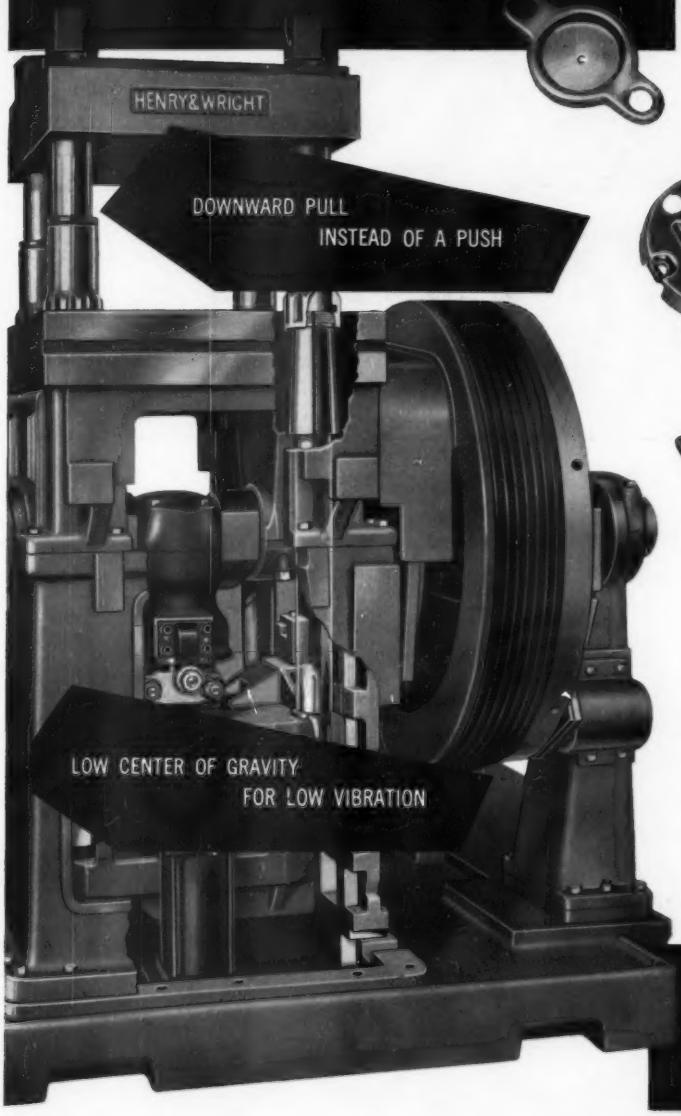
Allis-Chalmers
Milwaukee 1, Wisconsin

Please send information on ☐ brazing ☐ hardening ☐ annealing

Name..... Title..... Company.....

Street..... City..... State.....

YOU CAN LINE UP JOB AFTER JOB



The Henry & Wright Dieing Machine is easy enough to set up so that moderate production runs are profitable.

You can schedule one job after another. Your H & W will get the work out, get it out right, and have it done when the schedule says it ought to be done.

Simple jobs that you want to complete at high speed. Close tolerance work. Tricky reverse bends. Full assemblies at one pass through the press. They all will go through your Henry & Wright, and with surprisingly short interruptions for setting up.

Four corner control of side thrust, and a downward pull instead of a push: These are two of the reasons why your Henry & Wright will withstand more off-centering of the die loads. Jobs like those shown can be easily run in sequence on an H & W.

Henry & Wrights are making production runs that designers never had dreamed could be stamped at a profit. Our representative would like to show you some of the pieces.

Please write to Henry & Wright, 481 Windsor Street, Hartford, Connecticut.

H&W®

HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

HARTFORD, CONNECTICUT

Fisherman's Wharf

FPG Photo

BULLARD

The Invisible Background of Industrial Progress

Modern fishing fleets are no longer dependent on the winds for motive power — they are propelled by gasoline or Diesel engines traveling far and wide with the ever-changing schools of fish enabling the modern fisherman to make larger "catches" in shorter periods of time. Many of the boats have mechanical handling for the unwieldy fishing gear, and have refrigeration units to keep their "catch" fresh for market delivery.

Furthermore, canneries and processing plants employ modern methods with mechanical handling and packing equipment to bring the packaged product to your table ocean fresh.

All of this equipment, from the boats in the fishing fleet to that in the cannery, is made possible by *Modern Machine Tools* — "The Invisible Background of Industrial Progress."

THE BULLARD COMPANY · BRIDGEPORT 2, CONNECTICUT

Bullard Vertical Chucking Grinder

Available in six sizes 30" through 74"

Designed and built to maintain exceptional dimensional accuracy and produce uniform, infinitely smooth surface finishes on the larger sizes of work, the Bullard Vertical Chucking Grinder offers you these advantages: —

Accuracy — Production grinding on large diameters to two and a half tenths of a thousandth (.00025), as determined with an electronic measuring instrument.

Versatility — Grinding and turning operations on the same machine — A selection of cutting heads in combination with grinding heads can be made when ordering.

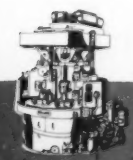
Variable speeds obtained from either of the dual control desks give required table speeds up to machine maximum.

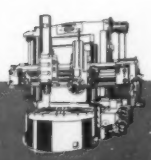
Both heads may be swiveled to meet angular requirements.

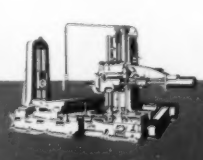
Maximum safety for the operator is provided by means of electrical interlocks so that the machine cannot be started while loading or making adjustments.

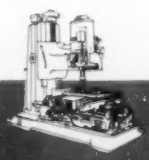
Vertical construction provides ease of loading — "It's easier to lay heavy work down than to hang it up."

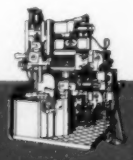
Call your Bullard Representative who will be glad to give you complete details or write to The Bullard Company, Bridgeport 2, Connecticut — phone EDison 6-2511.

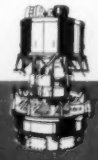

CONTIN-U-MATIC


CUT MASTER


HORIZONTAL BORING

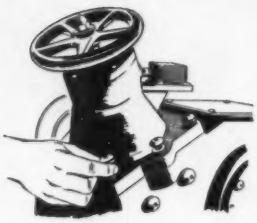

SPACER


MAN-AU-TROL


MULTI-AU-MATIC

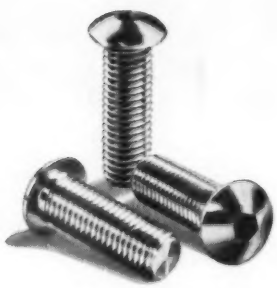
BULLARD

UNBRAKO button head socket screws are used exclusively to assemble this controlled volume pump, which was designed to fill the growing industrial need for the pumping of an allotted quantity of liquid at higher pressures, higher capacities.



The assembler inserts the UNBRAKO button head socket screw with his fingers, and runs it down as far as he can.

He then tightens it with a standard UNBRAKO key. Once seated, the low head design of the UNBRAKO button head provides a smooth, streamlined appearance.



UNBRAKO Button Head Socket Screws are made of heat treated alloy steel; have fully formed threads, Class 3 fit; are available in standard sizes from # 8 to ⅜". Accurate hex socket provides nonslip drive, prevents marring or mutilation of the head.

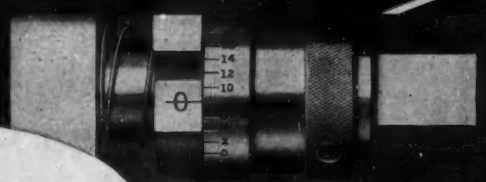
Save inventory dollars

Use UNBRAKO Standards—stocked by your distributor

Not only does your UNBRAKO distributor lower inventory investment, he also saves you time—and provides latest information about products, cost-saving methods, production techniques, current problems, trade practices. For latest data on UNBRAKO standard socket screw products, consult him or write STANDARD PRESSED STEEL COMPANY, Jenkintown 1, Pennsylvania.

UNBRAKO® SOCKET SCREW DIVISION

sps JENKINTOWN PENNSYLVANIA



blade clearance indicator

. . . precise adjustment, easily and quickly made by the operator, gives correct blade clearance for any gauge or type of metal, minimizes burrs and greatly prolongs blade life.

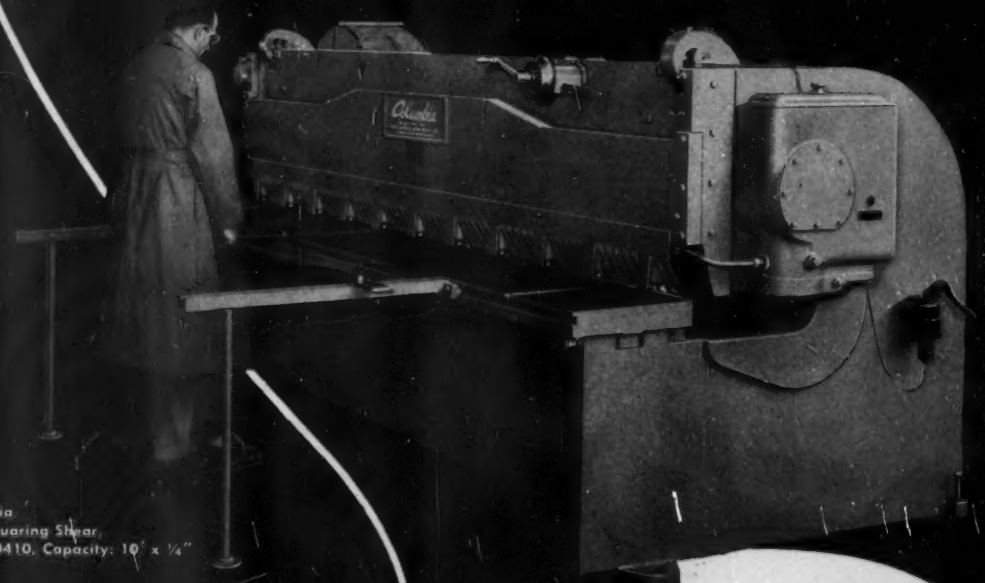
another **Columbia** shear feature

Columbia "New Series" steel squaring shears have many features specifically designed and refined to give low-cost, trouble-free operation.

quick-set blade clearance adjustment

The Blade Clearance Indicator, for example, lets the operator adjust blade clearance quickly and easily. This feature eliminates waiting for supervisory personnel, gives burr-free shearing on any gauge metal and significantly increases blade life.

Other Columbia features you should know about include the exclusive air clutch, hydraulic hold-downs, jog control for ram and others. Combine these with basic rigidity, rugged mechanism and long-lasting accuracy and you have the answer to low-cost shearing . . . the Columbia "New Series" Shear.



Columbia
Steel Squaring Shear,
Model 0410. Capacity: 10' x ¼"

Other exclusive Columbia features are explained in detail in FREE Bulletin No. PS-1. Write for it and the name of your Columbia distributor today!

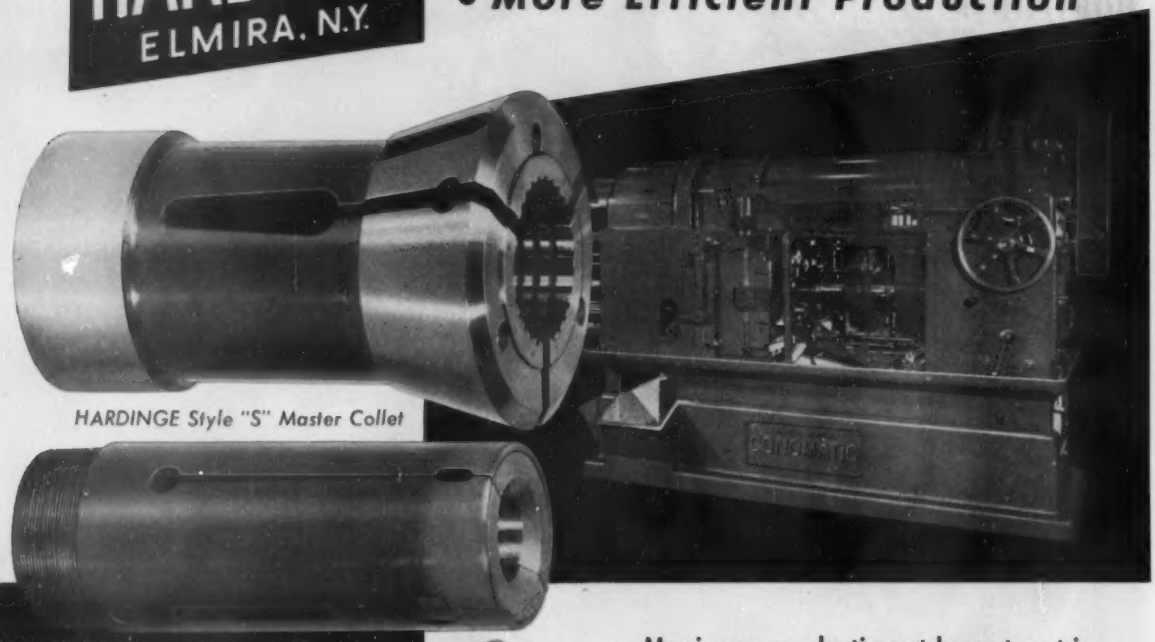
Columbia Division, The Lodge & Shipley Co.
Hamilton 2 Ohio

new series **Columbia** STEEL SQUARING SHEARS and POWER PRESS BRAKES

HARDINGE COLLETS and FEED FINGERS
for Cone Automatics*

HARDINGE
ELMIRA, N.Y.

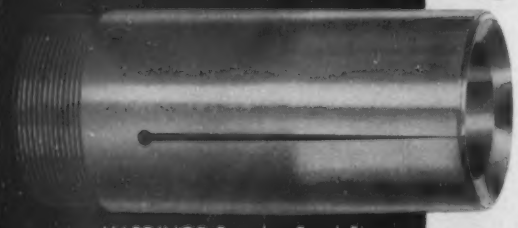
- *Low Tooling Cost*
- *More Efficient Production*



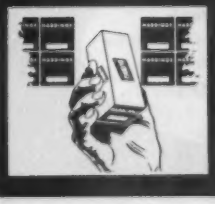
HARDINGE Style "S" Master Collet

HARDINGE Style "B" Master Feed Finger

HARDINGE Regular Collet



HARDINGE Regular Feed Finger



Immediate Stock Delivery
from Hartford
New York Philadelphia
Dayton Chicago
Minneapolis St. Louis
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Maximum production at lowest cost is assured when you specify HARDINGE Collets and Feed Fingers

Hardinge Master Collets and Master Feed Fingers feature low-cost replaceable pads that are interchangeable among different makes of automatics with the same capacity.

Hardinge Masters give true solid collet and feed finger performance.

Hardinge Regular Collets and Feed Fingers are precision made, hardened and ground internally and externally, and bring you the benefit of 62 years of engineering and manufacturing experience.

* *Also available for the following automatics: Greenlee, Gridley and Acme-Gridley, National Acme, New Britain*

Hardinge is your one source of supply for all collets and feed fingers.

HARDINGE BROTHERS, INC.
ELMIRA, N. Y.

KEMPSMITH
Defiance

HORIZONTAL BORING · MILLING · DRILLING MACHINES

The KEMPSMITH-Defiance line typifies KEMPSMITH leadership in terms of the *first* table-type Horizontal Boring Mill with **Outboard Supports** as an integral part of every machine. Here is a really good buy for general manufacturing, jobbing, tool and die work, because . . . **without any extravagant frills** . . . the KEMPSMITH-Defiance provides versatile, dependable, high-speed, precision boring, milling and drilling machine performance. Optional Low Speed Arrangement is an integral part of the head-stock. Massive oversize construction assures accuracy, rigidity and strength for permanence.

The KEMPSMITH-Defiance line is being manufactured initially with 4-inch and 5-inch diameter spindles, powered by 15 HP and 25 HP motors respectively. A variety of Table, Column and Bed Sizes are available to meet your needs. Nitralloy Spindles have Timken mountings.

A complete line of accessories is also available.

Write for Bulletin No. 136

A few territories still open for distributors. Write to

KEMPSMITH MACHINE CO.
Milwaukee 14, Wisconsin, U. S. A.

KEMPSMITH

PRECISION BUILT MACHINE TOOLS SINCE 1888

ARMSTRONG WRENCHES

Choose Your Wrenches as you do your friends--for life

Specify ARMSTRONG Wrenches for lifetime service, for finely balanced tools that feel right in the hand and make work easier, faster and less fatiguing. ARMSTRONG Wrenches generally are longer for size—give greater leverage. Accurately milled or broached openings give the proper clearance. They are safe wrenches because they are strong beyond need.

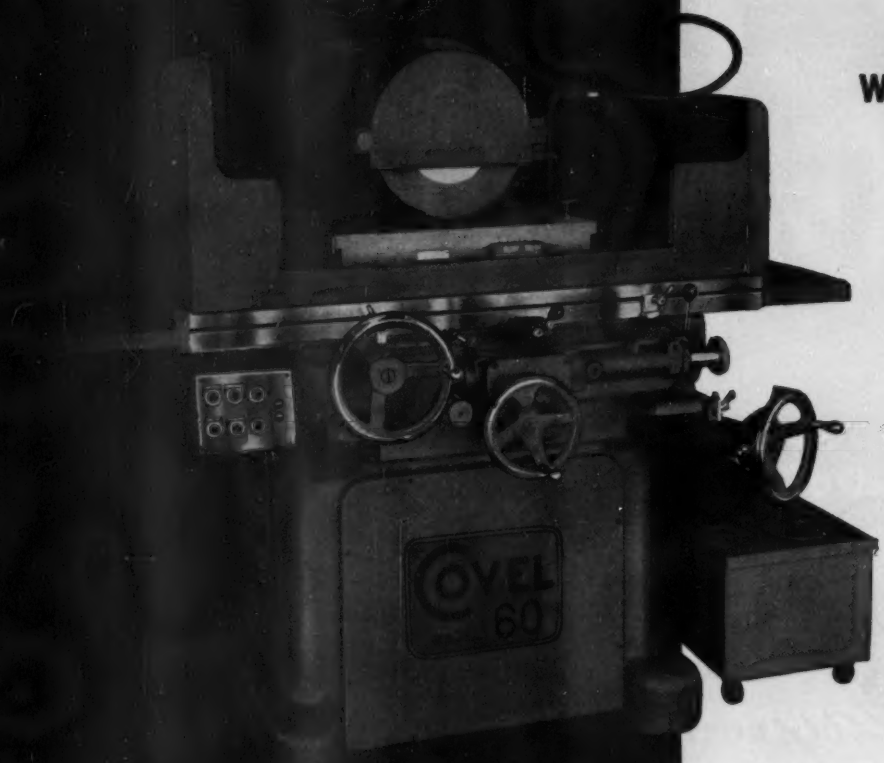
Drop forged and machined from high tensile carbon or special alloy tool steels, ARMSTRONG Wrenches are heat treated, tempered and tested to an exact balance of toughness, hardness and tensile strength. Each is beautiful in finish and line, is a quality tool to be proudly possessed by any mechanic—or certain to "give a lift" to any assembly line. Buy wrenches which carry the trade marks HI-TEN or ARMALOY. On carbon or alloy steel wrenches these trade marks are your guarantee of lifetime quality.

WRITE FOR CATALOG

ARMSTRONG BROS. TOOL CO. *"The Tool Holder People"*
5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.

COVEL No. 60 SURFACE GRINDER . . . ENTIRELY NEW

WITH 15" CROSS FEED



Covel presents the No. 60 — latest in its 80-year line of precision machines . . . This ultra-modern surface grinder features a 14" x 24" work surface . . . 15" width of cross feed . . . 27" table travel . . . vertical work capacity of more than 18" . . . automatic, closed circuit hydraulic system . . . powered elevation and a long list of advantages best described in a new bulletin . . . yours for the asking.

Here's a Typical Use:

This new "60" is set up for wet grinding the surface of a trim die for die castings — but one of the wide range of tool room and production jobs for which this latest Covel grinder is suited.

WRITE FOR *New Bulletin* No. AM-164

80 YEARS of continuous manufacturing experience makes your COVEL choice a sound one

COVEL PRECISION GRINDERS

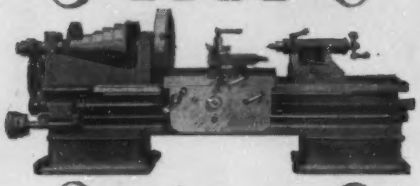
BENTON HARBOR, MICHIGAN

DRILL GRINDERS • UNIVERSAL CUTTER & TOOL GRINDERS • HYDRAULIC & HAND FEED SURFACE GRINDERS

5305

IN

1895

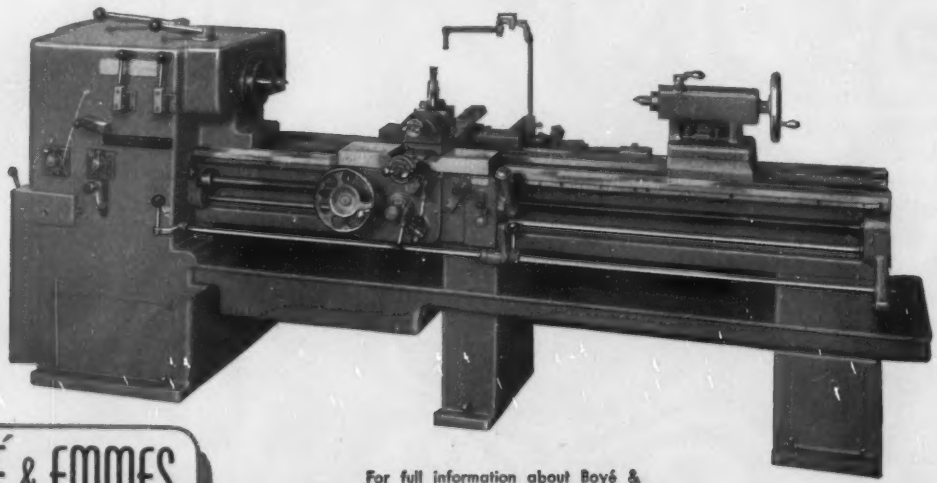


BOYÉ & EMMES
LONG LIFE
ENGINE LATHES
looked like this!

. . . In that year the Boyé & Emmes design featured a single back gear, which doubled the number of spindle speeds previously considered adequate.

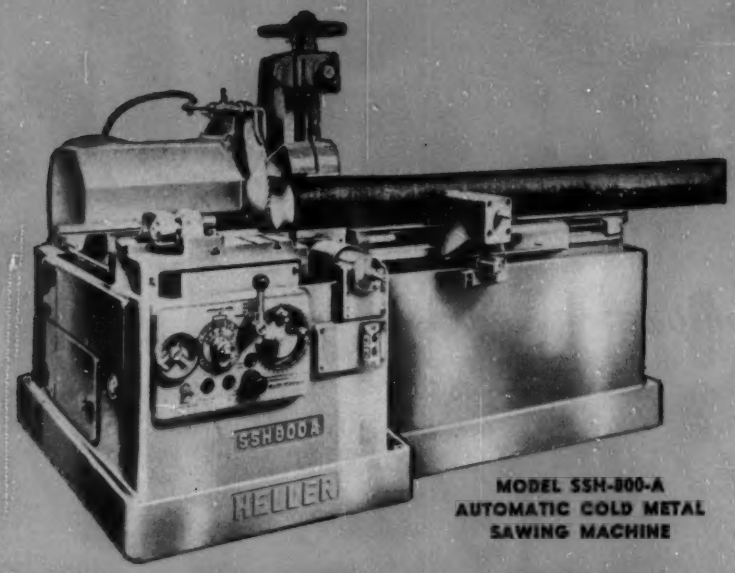
Today **BOYÉ & EMMES LONG LIFE ENGINE LATHES**

incorporate the accumulated know-how of fifty-nine consecutive years of exclusive engine lathe manufacture.

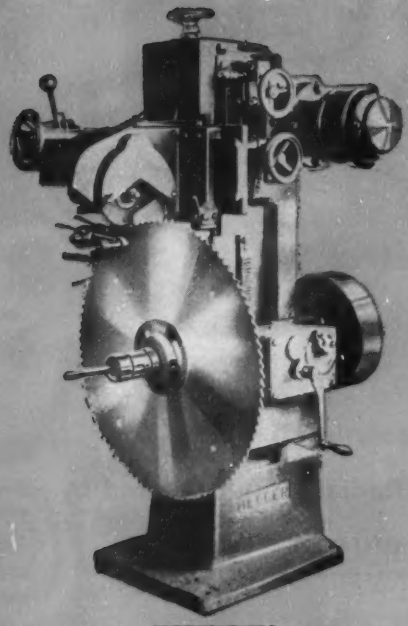


BOYÉ & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
CINCINNATI 16, OHIO
MACHINE TOOL CENTER of the WORLD

For full information about Boyé & Emmes extended range of spindle speeds and other modern design changes write for FREE Bulletin 5305. Ask also for our new folder "Fifty-Nine Years of Engine Lathe Evolution."



MODEL SSH-800-A
AUTOMATIC COLD METAL
SAWING MACHINE

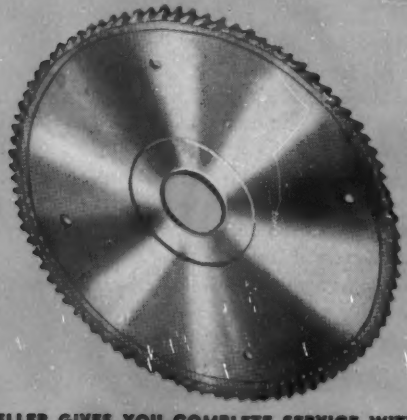


MODEL B-650
AUTOMATIC SAW SHARPENING
MACHINE

Cutting Costs and
Increasing Efficiency with

HELLER

COLD SAWING MACHINES
BLADE SHARPENING MACHINES
AND SAW BLADES



HELLER GIVES YOU COMPLETE SERVICE WITH
EXACTLY CORRECT BLADES.

Heller High Efficiency Cold Metal Sawing Machines are built in both manual and fully automatic types in machine sizes ranging from 3" bar capacity up to 48" billet capacity and blade sizes from 12" to 120" diameter. They are full hydraulic with completely centralized operating control. Illustration shows our SSH-800-A full automatic with bar capacity to 10" round stock.

The Model B-650 machine shown represents a new construction in arrangement and operating features. Using change gears and built-in dividing head, it insures a true tooth pitch and form and eliminates the use of a variety of master index plates for varying diameters and pitches of saw blades. Machine is rigidly constructed to secure extremely high grinding capacity and performance and produces a true and correct cutting tooth shape. Machines built in five sizes for 2½" to 120" diameter saw blades.

Importing Heller Machines Since 1926

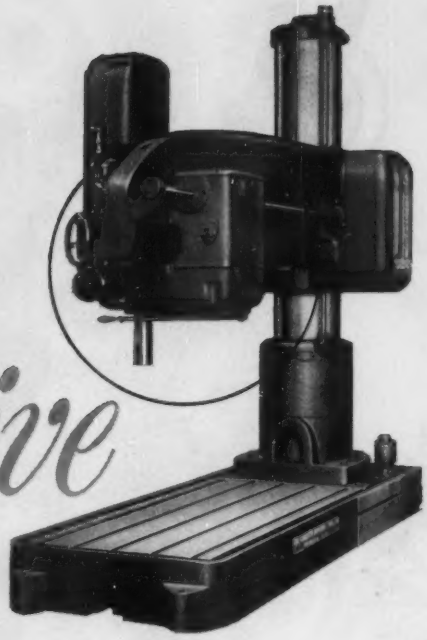
HELLER MACHINE COMPANY, 114 Liberty St., New York 6, N. Y.

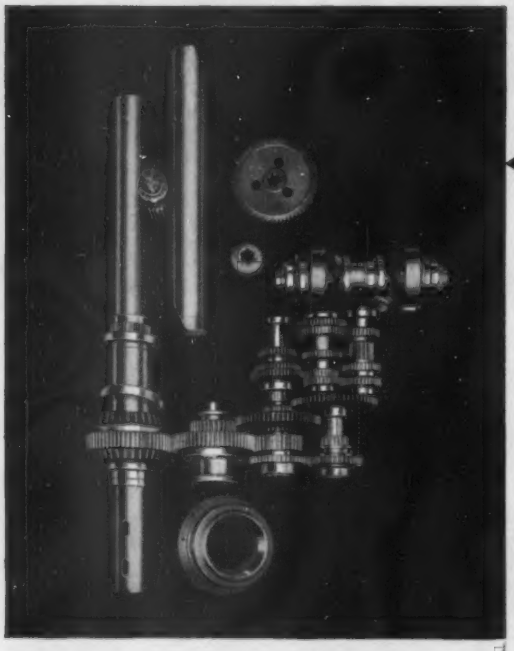
KNEE AND PLANER TYPE MILLING MACHINES • RADIAL AND COLUMN DRILLING MACHINES • TRANSFER MACHINES • SPECIAL MACHINES

comparison proves Carlton's

low hung drive

is without comparison





the main drive gear in all Carlton Radial Drills is placed in the *lowest part of the head.*

It drives on the *largest diameter* of the spindle, *closest to the cutting tool* . . . a principle well established by its wide use in planers, lathes and milling machines.

When you compare other radial drill driving mechanisms with Carlton's Low Hung Drive, you'll see why the overwhelming preference is for Carlton.

Thanks to the Low Hung Drive, Carlton can use an extra large spindle. And since the drive is always applied on the largest diameter of the spindle, it minimizes spindle twist . . . permits the use of higher speeds and greater feeds.

This principle—together with all ball bearing construction, low, centralized push button controls, modern lubrication, power clamping of arm, head and column, and Carlton's many other advantages—means increased "hole" production for you.

Why not write us today for bulletins describing the Carlton Radial Drills you need?

Carlton

THE CARLTON MACHINE TOOL CO.

THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO

National Tool Co.

Years of successful experience in special tooling and related production problems are yours for the asking. When the job requires special cutting tools call in your National Tool Co. representative. He is backed by more than 49 years experience in the engineering and manufacture of special cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

NATIONAL Tools CLEVELAND

National
TOOL CO.

Cleveland 2, Ohio

Just imagine drill heads you could anchor in AIR!

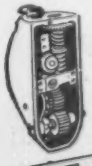
Think of the production possibilities . . . the tremendous time and cost savings . . . being able to locate spindles quickly in mid-air, at any angle, in any combination . . . being able to drill or tap any number of holes, simultaneously or in sequence, automatically or manually.

A startling concept? Using MAGNA DRILL, you can apply it right now in your own plant. Not only for special drilling and tapping jobs, but for standard operations as well.

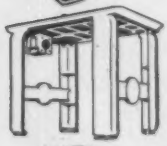
For with MAGNA DRILL, you build the machine around the part—just as if you were anchoring the components in air instead of to the rigid steel columns that provide complete freedom of setup.

Interested? Then let us send you details, specifications and prices. Also application sheets showing how other manufacturers are making profitable use of MAGNA DRILL—complete with cost breakdowns. Simply mail the coupon.

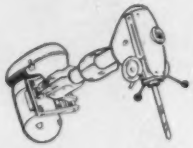
1001 QUICK SETUPS POSSIBLE WITH MAGNA DRILL MODULAR COMPONENTS



POWER FEED (Mechanical Type). Quickly attached. Feed rates .003" to .012" per revolution. Solenoid engage. Spring return. Automatic cycling. $195*.



TABLES AND LEGS. Drilled and tapped for mounting bases horizontally or vertically. Tables may be ganged. Single table, 24"x 20," $185*. Double, 24" x 40," $235*.



DRILL HEADS. Individually powered. Fully adjustable. Right or left hand manual feed. Choice of spindles. Price complete, less motor, $285*.

COLUMNS AND BASES. Heavy ⅝" walled tubes. 3½" O.D. Precision ground. Angle indexed. Bases are line-bored cast iron. $48*.

LEAD SCREW TAPPER. Replaces standard quill in 10 minutes. Includes reversing starter and controls, limit switch control plate, all wiring. $260*.

*F.O.B. your plant.

MAGNA ENGINEERING CORPORATION, *Dept. 268-L, at factory nearest you*
12819 Colt Road, Cleveland 8, Ohio, OR Menlo Park, California

☐ I'm interested. Send me specifications, prices and application sheets for MAGNA DRILL.

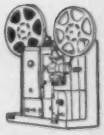
☐ Would like to arrange a showing of the MAGNA DRILL film on or about _____ (date).

Name _____

Position _____

Company _____

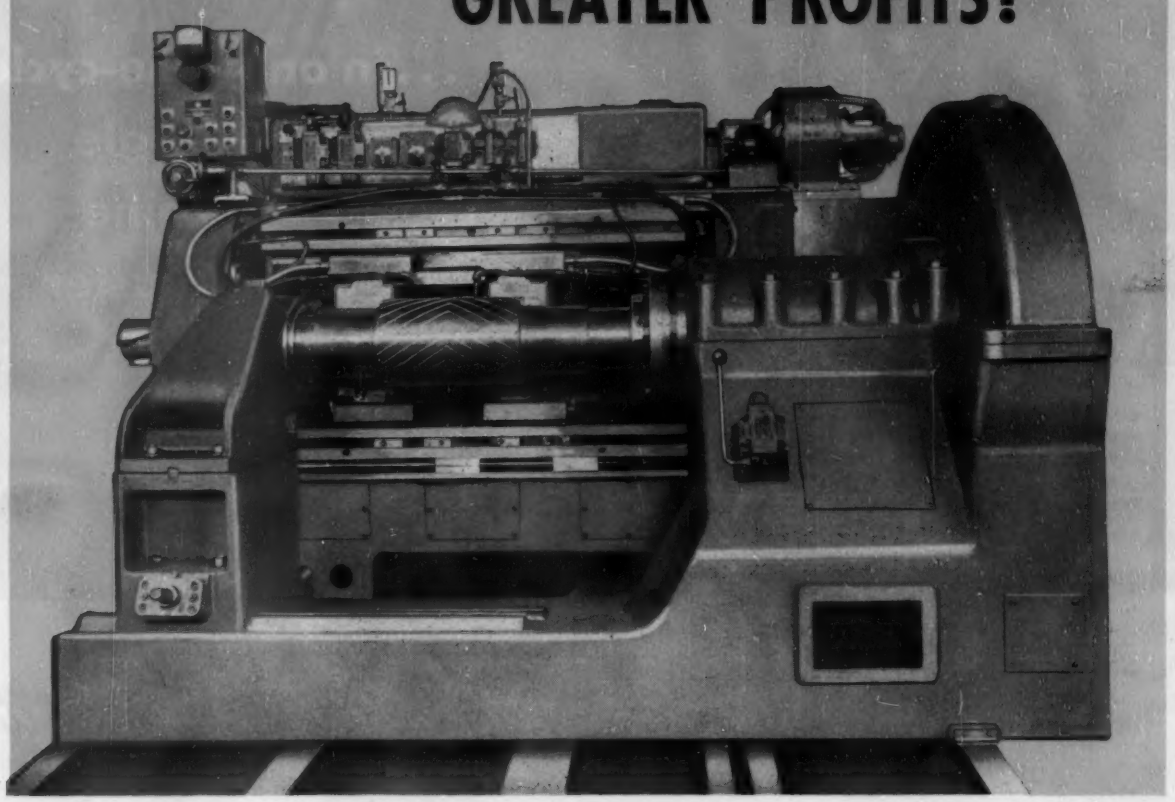
Address _____



SEE MAGNA DRILL IN ACTION ON FILM!

Now you can see the full, dramatic, cost-cutting possibilities of MAGNA DRILL right in your own plant. A 20-minute, 16mm sound film is available for showing to interested groups wherever they may be located. Just address your request to Magna Engineering Corporation, Menlo Park, California. We'll make all the arrangements. This is one movie you won't want to miss!

HOW TO "PRECISION GENERATE" GREATER PROFITS!



The speed, in operation and set-up, of a Farrel-Sykes "Twin-Head" gear generator, will cut your man and machine hours, and therefore decrease your manufacturing costs. New design features contribute to more efficient operation. Rapid selection of speeds and feeds, easy adjustment of cutters, easy and positive control of infeed, are examples.

And the accuracy inherent in the Farrel-Sykes process of gear generation assures accurate tooth spacing, profile and helix angle. The gears you make will operate smoothly, quietly and efficiently for many years to come.

The "Twin-Head" generator cuts all types of herringbone gears, single helical and spur gears, two members of a cluster gear simultaneously, and other toothed and cylindrical forms.

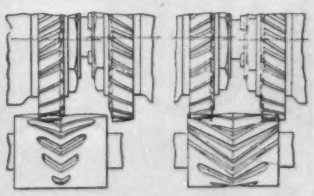
Ask for bulletin T-455.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Cambridge (Mass.), Akron, Cleveland, Chicago, Los Angeles, Houston

Farrel-Birmingham®

FB-935



PRECISION GENERATION

The Farrel-Sykes gear machine is equipped with two cutters mounted on a single carriage. The cutters reciprocate, each ending its stroke at the center of the blank. As they cut, they rotate to generate the helices and also slowly revolve in unison with the gear blank to generate the tooth contours precisely.

Caterpillar

REG. U.S. PAT. OFF.

. . . in one time-cycle . . . on a single machine . . . and faster

JOB FACTS:

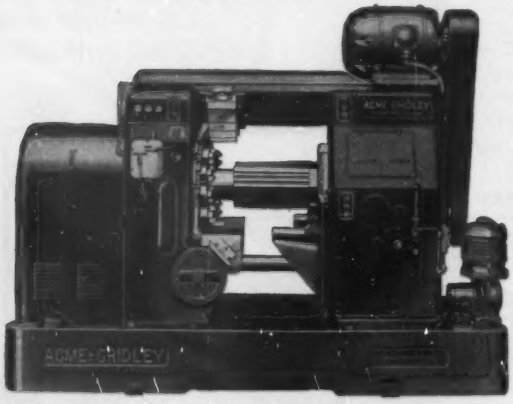
PART—Track Roller Bushing
SIZE—4¾" diam. x 11½" long
MATERIAL—Cast Iron
OPERATIONS—32, Carbide Tooling
MACHINE TIME FOR ALL OPERATIONS—43 seconds, 83 pieces per hour

CATERPILLAR Tractor Company is the world's largest producer of crawler type tractors. As they grow bigger each year, they specify larger heavier, more costly automatic machines—in this case a 20-ton, 8-spindle hydraulic chucker, for repeated runs on the part illustrated as well as others.

A fair question to ask is "Why the investment, why not do the job the single spindle way, or on 4-spindle automatics—why use 8-spindles?"

Plainly because they know the value of man-hours and floor space—have long since proved through comparison of actual cold cost production figures that the lowest machining costs yet possible are obtained by 2-at-a-time planning with

ACME-GRIDLEY 8-SPINDLE AUTOMATIC CHUCKING MACHINES



8 SPINDLE 8" ACME-GRIDLEY CHUCKER— built also in 4 and 6 spindle models and in sizes 5¼" to 12".

Here's how they do it...

• the advantages are basically 3...and they interlock—

1. **MORE SPINDLES**—with double index to finish both ends of the piece at the same time—more tools with one machine, one operator and in a cycle time that is always controlled.
2. **BROADER BASE**—adaptability to similar jobs—through interchangeability of tools, attachments, cams and gears—reducing the change-over costs and inventory.
3. **EXPERIENCE AT SOURCE**—Caterpillar knows that Acme-Gridley basic design, stamina and tool engineering to solve new problems are dependable—never let you down.

This is just another example among thousands based on our 55 years since we produced the first "multiple." Maybe your chucking problems are simpler, which makes it easier for you and for us. Why not find out, anyway?

The NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS
1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • Limit, Motor Starter and Control Station Switches • Solenoids • Contract Manufacturing

"TOOL LIFE UP 400%
PRODUCTION UP 50%
WITH GULF CUT-AID"

says Mr. C. E. Tedford,
vice president and plant manager of the Eastman Products Corporation, Plano, Texas.

Mr. Tedford and a Gulf Sales Engineer check an aluminum fitting produced by one of the Warner & Swasey Automatic Screw Machines in the Eastman shop. The cutting fluid used is Gulf Cut-Aid. Eastman makes copper tube fittings, hydraulic hose couplings, and auxiliary equipment for air conditioners.

A cutting fluid has to be outstanding to increase tool life 400% and production 50%—and that's what Gulf Cut-Aid has accomplished at Eastman Products! You too will discover that Gulf Cut-Aid, when used for machining aluminum, magnesium, and many other nonferrous metals, consistently produces better results—that means lower costs for you.

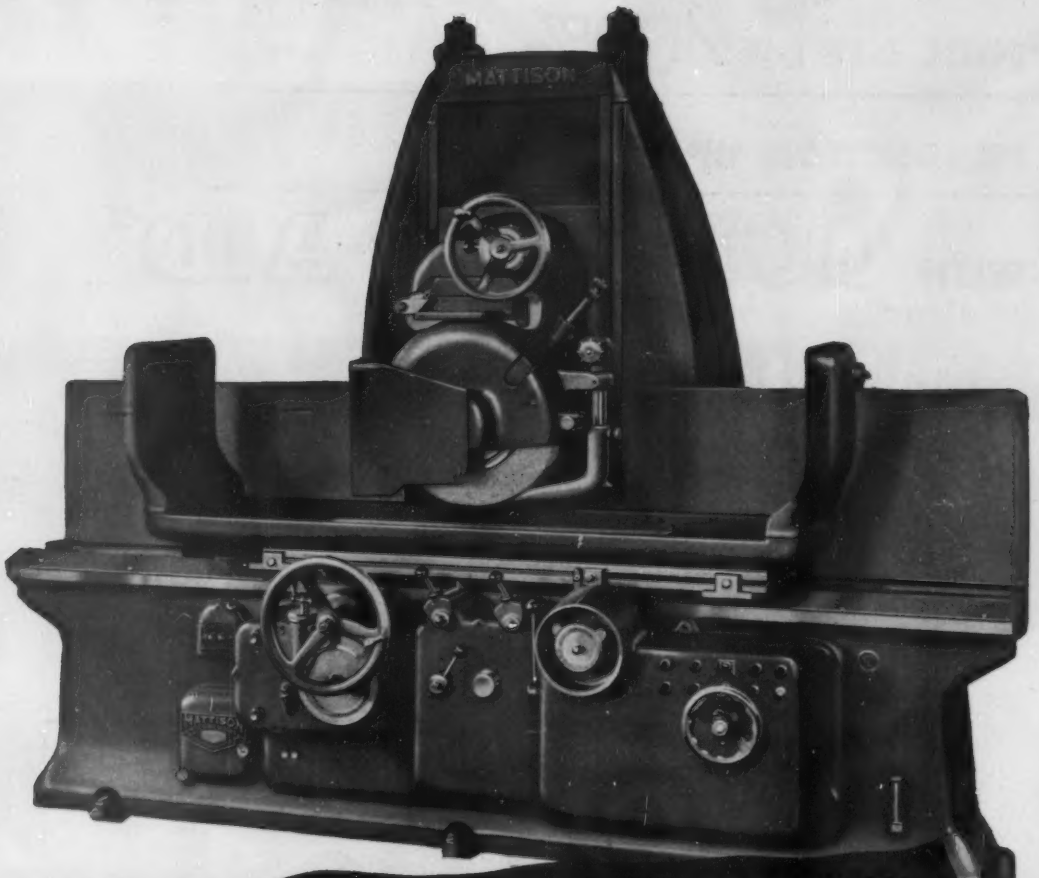
Here are some of the advantages of Gulf Cut-Aid that make such results possible: high rate of penetration, "wettability," and excellent cooling properties. It quickly covers tool surfaces to provide constant protection. It also contains an effective anti-oxidation additive which helps prevent gum and sludge formation in the coolant system. And it will not corrode or stain metals.

Let a Gulf Sales Engineer assist you in finding opportunities for improved machining practice in your plant through the use of Gulf Cut-Aid. Contact him at your nearest Gulf office today.

Gulf Oil Corporation · Gulf Refining Company

1822 GULF BUILDING, PITTSBURGH 30, PENNSYLVANIA

GULF SERVES INDUSTRY



HERE'S A CHANGE THAT INCREASED PRODUCTION FROM 30 PER HOUR TO 200 PER HOUR

Both sides of type-stamps are now ground 200 per hour on a Mattison Grinder. Previous production—30 per hour.

● Because of the greater load and grinding area of their Mattison High Powered Precision Surface Grinder, Geo. T. Schmidt, Inc., Chicago, Illinois have been able to effect considerable savings in grinding time over their previous method. As an example—the type stamps shown in the picture above were formerly ground a few pieces at a time on a small grinder—30 per hour. The Mattison Grinder they are now using provides larger table space and a larger grinding wheel together with the necessary power and stability to permit the grinding of more pieces per load at a production rate of 200 per hour. Similar results are obtained on other parts.

Mattison High Powered Precision Surface Grinders have the high power and rugged double-column construction for rapid stock removal and the precision necessary for high quality finish and accuracy to close limits.

This combination not only will enable you to step up production on small parts, but permits grinding large work which previously could not be handled. For further information send for free circular.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

"AMERICANS" WORKING FOR NORDBERG

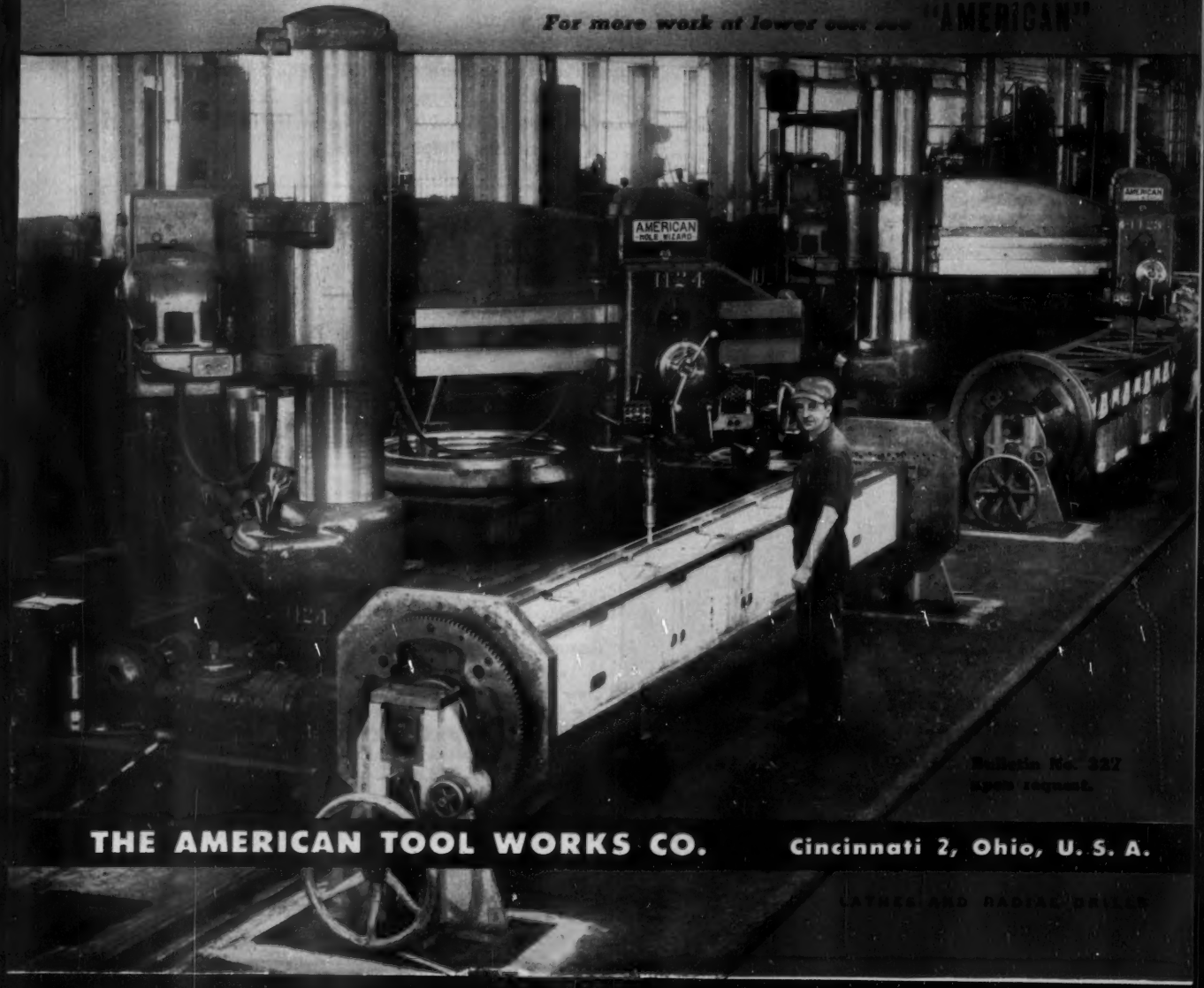
helping to profitably produce the quality products for which Nordberg Manufacturing Company of Milwaukee, Wisconsin is known the world over.

These "AMERICAN" Track Type Hole Wizard Radials mounted on mobile bases speed up drilling, tapping and boring operations in long, heavy work pieces by bringing the tool to the work rather than moving the work to the tool.

The work pieces are mounted in elaborate trunnion jig fixtures so different work planes may quickly be presented to the tool and a high degree of accuracy maintained.

The quality of Nordberg products is universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to it.

For more work at lower cost use "AMERICAN"



Bulletin No. 227 upon request.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

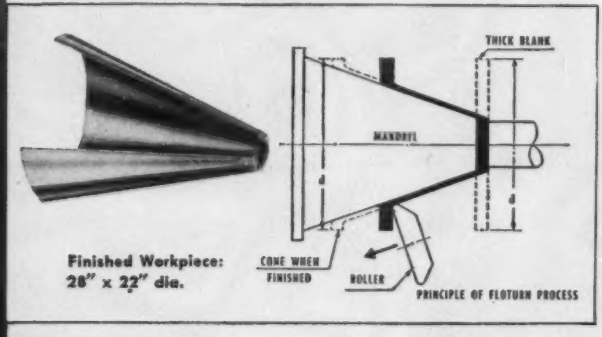
FLOTURN

a new Lodge & Shipley development in metal forming

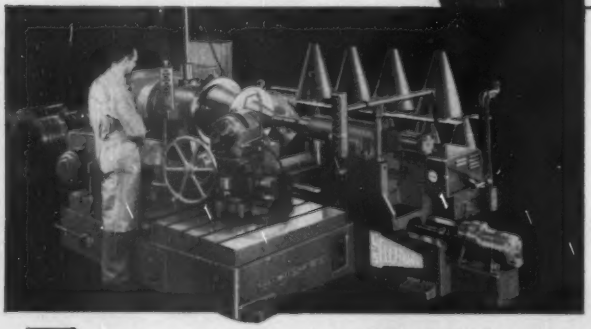
Axially rolls simple blanks into complex forms Displaces metal by cold flowing

FLOTURN is a new process originated by Lodge & Shipley. FLOTURN offers startling advantages in precision metal forming at production rates with low-cost tooling. If you are now producing conical or cylindrical parts by conventional drawing, welding, or machining methods FLOTURN may offer you amazing savings in time, materials and tooling! FLOTURN equipment or sub-contract service is available only through Lodge & Shipley and its distributors. Write for

Write for complete details.



Finished Workpiece: 28" x 22" dia.



No. 40 Lodge & Shipley Floturn Lathe for cold forming.

L S FLOTURN

THE LODGE & SHIPLEY COMPANY
3055 Colerain Avenue, Cincinnati 25, Ohio

HOW FLOTURN WORKS

. . . the FLOTURN process starts with either a simple flat blank, machined blank, machined forging, drawn cup, wrapped and welded cylinder or centrifugal casting. FLOTURN equipment scientifically applies great pressure against the blank, causes the metal to flow in a cold state. Pressure is spirally applied continuously, flowing the metal to the shape of a mandrel.

FLOTURN IS HIGHLY ACCURATE

. . . wall sections of work are uniform, predetermined, with never changing thickness and can be easily held to ± .002".

FLOTURN SAVES TIME, MATERIALS, TOOLING

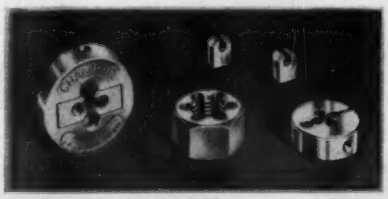
The FLOTURN blank weighs the same or slightly more than the finished part. FLOTURN tooling is low in cost—only about 1/10 the cost of deep draw dies, for example. Tooling life is long. FLOTURN forms a wide range of metals—from mild steel to the toughest alloys. FLOTURN adds strength and hardness.

NEW PLASTIC TAP BOXES

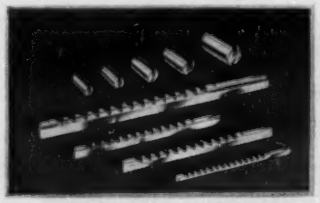
COMPLETE LINE OF STANDARD & SPECIAL TAPS

PROTECTED QUALITY

It's apparent how Threadwell TAP quality is protected by the original plastic tap package shown above. BUT . . . the quality of ALL Threadwell products is ***triple protected.*** At the ***factory*** by rigid process and individual final inspection . . . in ***transit and storage*** by advanced packaging and clear labeling . . . and in ***use*** by Threadwell Field Engineers strategically located nation wide to help you with cutting tool and gaging problems on the job.



ADJUSTABLE ROUND, 2-PIECE & HEXAGON DIES

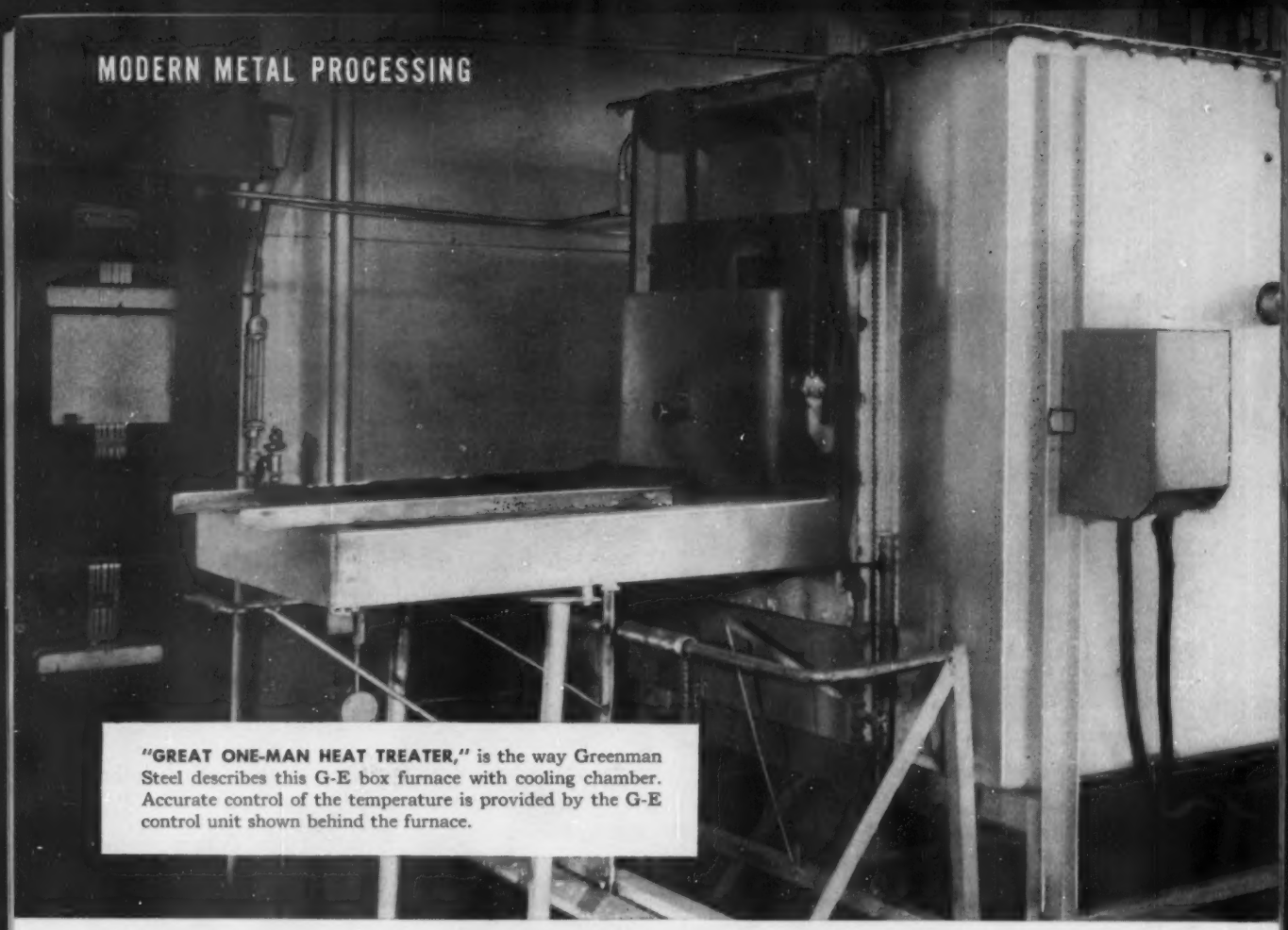


KEYWAY BROACHES & SETS

COMPLETE LINE OF HIGHEST PRECISION GAGES

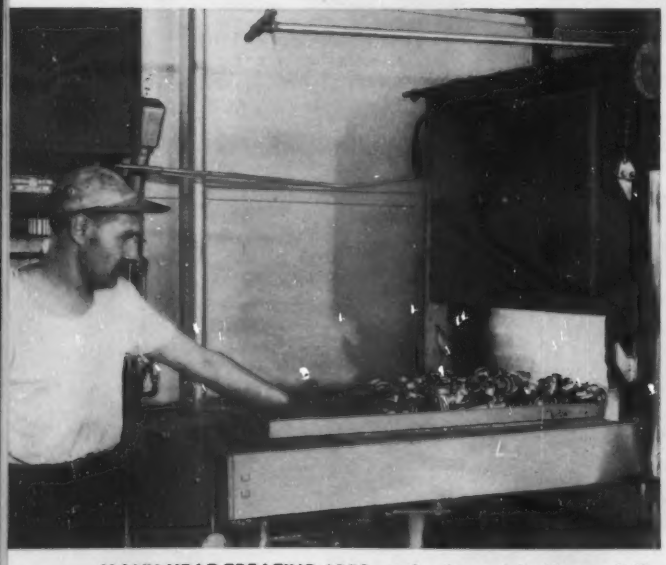
THREADWELL DISTRIBUTORS, too, are strategically located to serve you promptly, properly, and well.

THE FINEST IN CUTTING TOOLS & GAGES



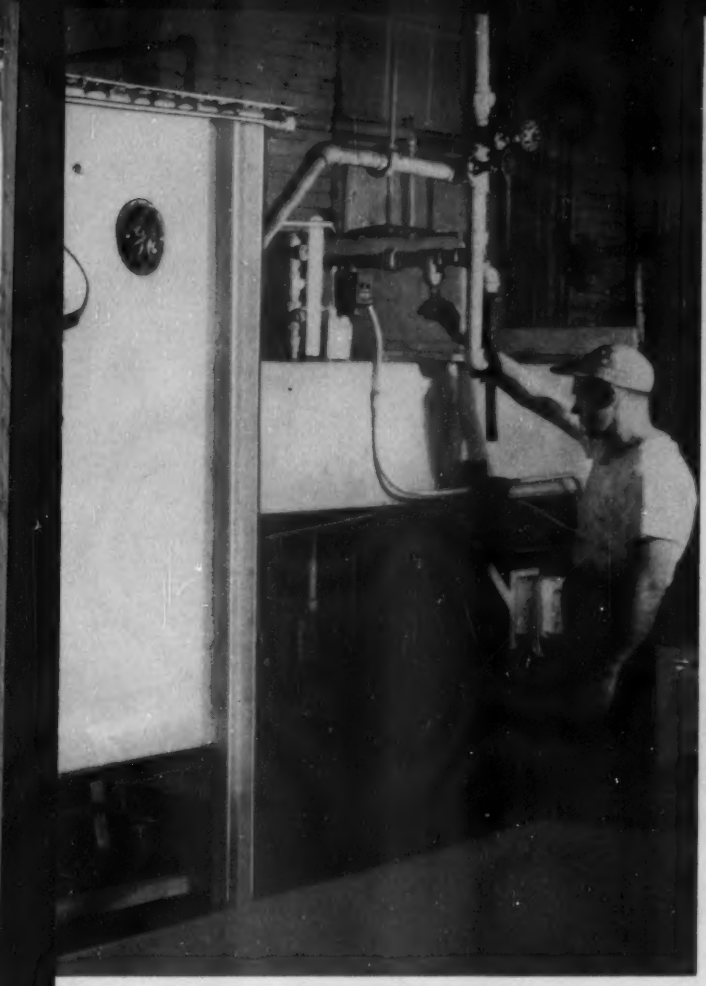
"GREAT ONE-MAN HEAT TREATER," is the way Greenman Steel describes this G-E box furnace with cooling chamber. Accurate control of the temperature is provided by the G-E control unit shown behind the furnace.

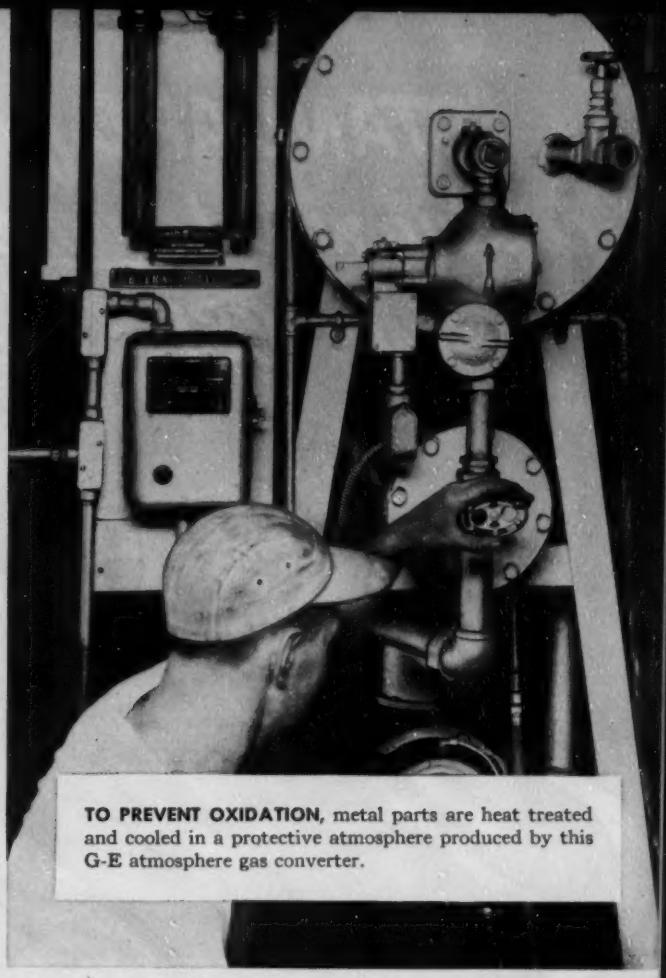
"Versatility of G-E Furnace Almost



MANY HEAT-TREATING JOBS can be done with this one G-E box furnace. Greenman Steel uses it for copper brazing, silver brazing, annealing, and hardening. Here, the furnace is employed to anneal drawn-steel cups.

HIGH-QUALITY WORK is achieved by moving the parts directly from the furnace to the atmosphere cooling chamber, thereby minimizing oxidation. Here, the parts emerge from the cooling chamber clean and bright.





TO PREVENT OXIDATION, metal parts are heat treated and cooled in a protective atmosphere produced by this G-E atmosphere gas converter.

Unlimited," Says Industrial Heat Treater

Operational savings of G-E furnace keep Greenman Steel competitive

Heat-treating jobbers who demand versatility in a furnace find that General Electric's box furnace with water-jacketed cooling chamber is ideal for general-purpose work.

Says Lloyd G. Field, General Manager of Greenman Steel Treating Corp., Worcester, Mass.:

"As a heat-treating jobber, we have to produce high-quality work at lower cost than equipment manufacturers can do it themselves. We must be ready to handle all sorts of heat-treating jobs, yet our investment in equipment must be kept to a minimum. We find that our G-E box furnace satisfies all these requirements. It enables us to stay competitive because it produces superior work at low cost. It minimizes our equipment costs because its versatility is practically unlimited. We use it to copper braze, silver braze, anneal, and harden."

MANY SAVINGS, HIGH-QUALITY WORK

Mr. Field pointed out that operating costs are low because the insulating qualities of the furnace minimize heat loss. Automatic control of the heat assures him of high-quality work.

FOR APPLICATION HELP

Whether your operation demands a small-capacity, all-purpose furnace, or one that is engineered for a particular process and intended for high-production rates at the lowest possible cost, General Electric can satisfy your requirements. For application help from a G-E Heating Specialist, contact your G-E Apparatus Sales Office.

GENERAL ELECTRIC

WRITE NOW FOR THESE MODERN METAL PROCESSING BULLETINS

- Furnace and Induction Brazing, GEA-5889
- Annealing Malleable Iron, GEA-5797
- Forging with Induction Heat, GEA-5983
- Heat-treating Aluminum, GEA-5912

Address: General Electric Co., Section 720-129, Schenectady 5, N. Y.

"STANDARD for cutting metal and costs since 1881"

Red Shield says:

Cut machining costs . . . standardize with Standard. Complete line . . . top quality tools. Backed by factory application specialists coast to coast. Distributors in all principal cities.

STANDARD TOOL CO.

3950 CHESTER AVENUE CLEVELAND 14, OHIO

FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools*

Saves $11,549 a year with one DENISON MULTIPRESS®

...all on a $3,000 investment. At Penn Controls, Inc., the former method of staking or riveting with a mechanical press was too slow . . . actually scrapped 376 pieces a day due to variations in size of components.

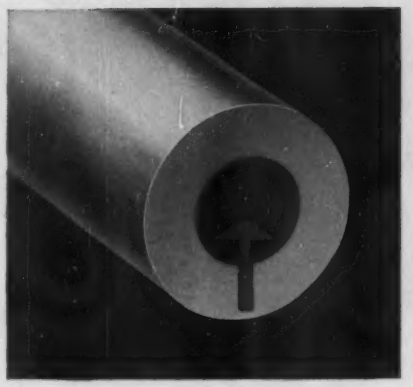
Now, women operators simply load the six parts of the magnetic switch onto the index table of a 4-ton Denison Multipress. With one smooth hydraulic stroke of the Multipress ram, parts are accurately staked together . . . saving $7,345 a year on scrap reduction alone.

With the same labor, Multipress has nearly doubled production.

Staking is one of hundreds of different jobs performed by the Denison hydraulic Multipress. For bulletins and case studies of applications in the 1 to 75-ton pressure range, write to: THE DENISON ENGINEERING COMPANY, 1164 Dublin Rd., Columbus 16, Ohio.

DENISON Hydr OIL ics

a hole here is a nuisance...



a hole here is an advantage

Crucible Hollow Tool Steel Bars are saving time and money for more and more members of the metalworking industry. By using these hollow bars you eliminate drilling and boring operations, increase machine capacity and cut scrap losses.

Now, you can get hollow bars of any of Crucible's famous tool steel grades, in almost any combination of O.D. and I.D. sizes. And you can get *immediate* delivery of five popular grades from your local Crucible warehouse—KETOS® oil-hardening, SANDERSON® water-hardening, AIRDI 150® high carbon—high chromium, AIRKOOL® air-hardening, and NU DIE V® hot-work tool steels.

Your Crucible representative can point out ways to save time and money by using Crucible Hollow Tool Steel Bars.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **HOLLOW TOOL STEEL**

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

you can
SAVE TIME
and
MONEY
on
jobs like this
with
the

...GISHOLT SPEED SELECTOR!

HERE'S WHY:

No manual gear shifting! You simply turn this hand wheel or touch a trip lever (for Direct or Pre-set operation). Shifting is automatic—by hydraulic power—while the operator positions the new tools for the next cut.

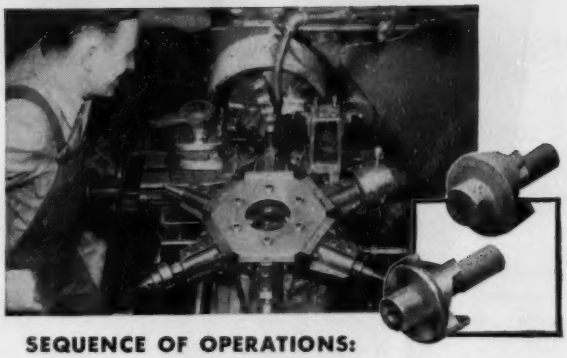
It's all so much simpler with the Speed Selector. There's no need for time-wasting computations, no mental effort, no physical effort. With simple controls, either direct or prearranged, the operator gets the ideal f.p.m. cutting speed for each cut. And it's *much faster,* of course!

The Speed Selector is standard on Gisholt Nos. 4 and 5 Ram Type Turret Lathes and on all Gisholt Saddle Type Lathes.

GISHOLT
MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

HERE'S HOW:



SEQUENCE OF OPERATIONS:

Note the star which indicates each time the Speed Selector is used.

★ **1. Hexagon turret—Center drill at 297 r.p.m. hand feed**

2. Hexagon turret—Support with live center

★ **3. Square turret—Rough turn and face at 96 r.p.m., .003 feed**

★ **4. Square turret—Finish turn, face and chamfer at 126 r.p.m. .002 feed**

★ **5. Hexagon turret—Start and drill through at 226 r.p.m., .003 feed. Trip the Hi-Lo lever, eliminating even the need for turning the hand wheel**

★ **6. Hexagon turret—Thread with tap at 39 r.p.m., leaders and followers**

—and you're ready for a new workpiece

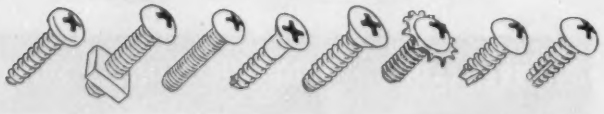
TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

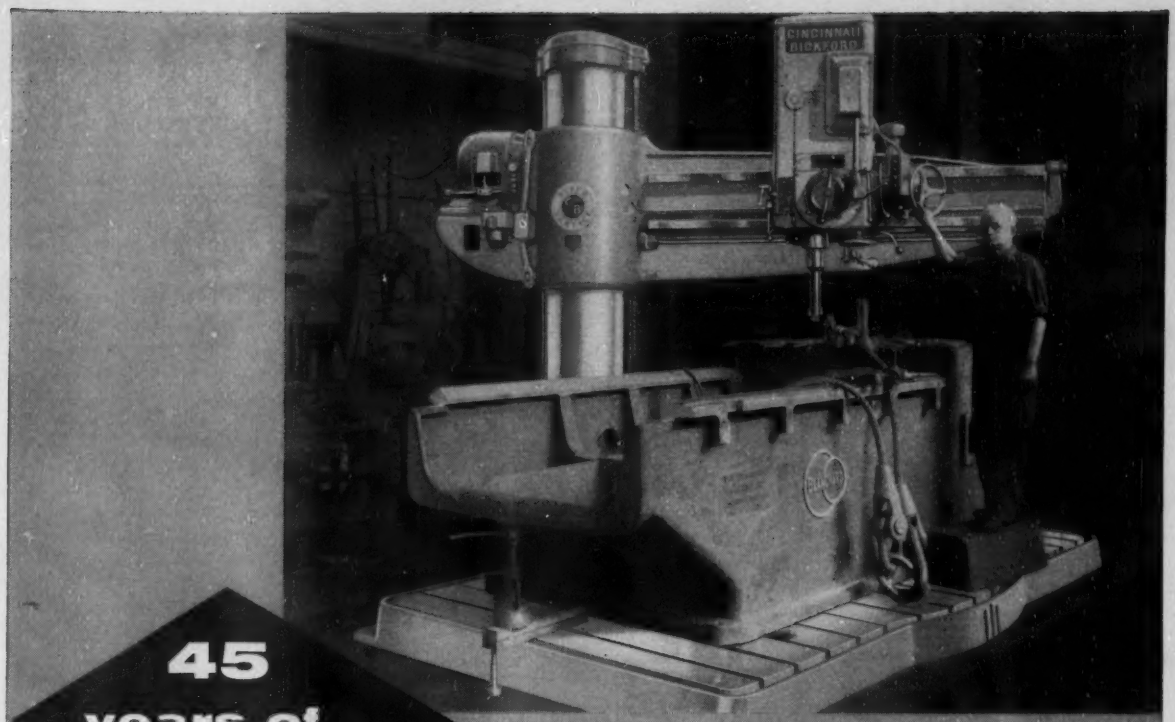
"Here's how ***AMERICAN*** *cut our Fastener cost more than* **50%** *with this* ***STAINLESS SPECIAL"***

Here again American accepted a challenge, and came up with a stainless refrigerator stud *successfully cold-headed* . . . instead of milled from the bar, as before. And here again is proof that American know-how means substantial savings, even on fasteners made from costly material. *Savings here ran from 50% to 75%.*

So whatever your question in regard to fasteners, American has the right answer *cost-wise* . . . in standard Phillips cross-recessed-head products . . . or in specials like the one shown here . . . and in the metal best suited to the job. Now . . . what *is* your question? Write:

AMERICAN SCREW
COMPANY
WEST MAIN & EAGLE STREETS, WILLIMANTIC, CONNECTICUT
Plants at Willimantic, Conn. and at Norristown, Pa.
Warehouse and office at Chicago
Office, Detroit, Michigan

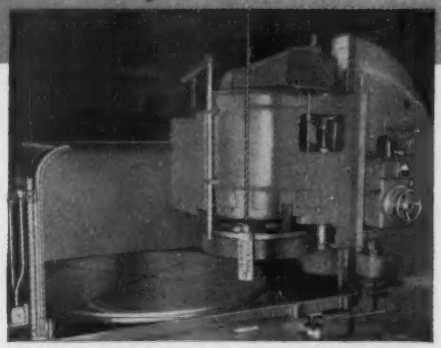




45 years of experience speaks

"Well, if you don't buy a Cincinnati Bickford let me keep the one I have."

EMILE BROUILLARD



A close-up of 42-7284 Blanchard Surface Grinder.

Photos courtesy of the Blanchard Machine Company, Cambridge 39, Mass.

Extreme accuracy is required in drilling 12 holes in base of large Blanchard Surface Grinders.

Three of these holes are for 3″ x 18″ studs, which provide column adjustment, to required flatness accuracy of .0002″ on an 84″ diameter magnetic chuck. The diameter of the three bores for the column studs are held to ± .0005″. Time on these operations was reduced an hour with the installation of this large Cincinnati Bickford Drilling Machine. This operator has not had an accident in 45 years of operating Cincinnati Bickford Super Service Radials. Twelve machines have been installed here, for their safety, production accuracy and general satisfaction.

Write for Catalog R-29.

80 YEARS OF SERVICE

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

Keep Your on the OLIVER Line — Cost Cutting Production Boosting MACHINE TOOLS

OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers, with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder.—Hand operated for Drills No. 57 to ½".

No. 510 For Drills ¼" to 3"—2-3-4 flute.

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model S-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten-Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15" —also, slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER

Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 1½" wide x 1¾" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten-Carbide and high speed tools—offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

Write Today For Complete Information

OLIVER INSTRUMENT CO.

1414 E MAUMEE • ADRIAN, MICHIGAN

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Good Riddance

Sentimentality has no place in modern industry, and while Mr Herndon laments the passing of Old George (*AM*—July 5 '54, p93), I for one say, "Good Riddance."

Perhaps Mr Herndon and I are of the same generation, for I, too, remember Old George—or his counterpart—but I suspect from his address that he is now retired, while I am still active in industry, despite my age. I, too, remember the awe with which, as an apprentice, I regarded George's skill and ingenuity, but I realize now that he was, in reality, a long way behind the times, even in those days.

I would back myself, even at my age, to teach a 'prentice lad more tricks of the trade than Old George even dreamed of; and to teach them with tools and equipment that he would use in any modern shop. In today's plants we don't want our boys to be instructed by the hit-or-miss methods of half a century ago. We want them to be properly taught by competent instructors on a regular schedule.

I have seen George chip and file an inch or more of metal from a piece of work, as flat and true as the proverbial billiard table. But it took him all day to do it. I agree that a boy should learn to use a chisel and file, and he should not learn to think in those terms. He should think first of the milling machine and surface grinder, in terms of optical flats, rather than billiard tables, and in machine-time minutes rather than days.

Don't weep for Old George, Mr Herndon. Give thanks, if you will, that you have seen his day, but be glad that day has passed and given place to a brighter one.

A R McCleod
Glasgow, Scotland

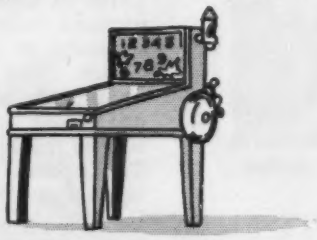
Public Schools Serve, Too

Referring to the excellent article on apprenticeship (*AM*—Nov 9 '53, p129), I would like to make the following comments:

With reference to costs, the article

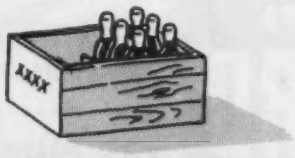
GRINETICS

By D G SMITH



TILTING TABLE

FLOATING HOLDER



SPLIT CASE

Republication rights reserved

OK carbide end mill hogs out tough, torchcut 1020-30 boilerplate for Producto Die Sets

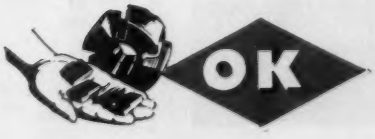
A fine example of heavy milling is this bolt seat for Producto die set clamp pads. Milled sections up to 1¼" depth and 3" width are cut at the high rate of 7 to 10" per minute. With **one** pass of the tool, an OK carbide end mill, mounted on a specially built Producto clamp pad miller, and driven by a 30 hp motor, removes slabs of metal weighing 10 lbs. from each side in less time than it takes to read these lines. This is a tough metal-cutting job because hard edges caused by flame-cutting are not appreciably softened during the annealing process which precedes milling.

At Producto Machine Company, Bridgeport, milling cutters for cutting steel are painted RED. Carbide cutters for milling semi-steel are painted ORANGE. This color distinction reduces errors in the tool room and is highly recommended.

JOB DATA

WORKPIECE — Clamp pad for well-known Producto die set.
STEEL — Annealed flame-cut 1020-30 boiler plate with hard-spot edges caused by terrific heat from the torch.
MACHINE — A special clamp pad miller built in Producto's own shop powered with a 30 hp motor.
CUTTER — A 5"-8-blade OK carbide end mill, the only mill found capable of handling this tough job.
RESECTION — A piece irregular in shape varying from 10 to 15" in length, 2-3" in width and up to 1¼" in depth.
FEED — 7 to 10" per minute.

Write for OK Tool Catalogs



TWO COMPONENTS— -BODY AND BLADES

modern milling cutters for modern milling machines

THE OK TOOL COMPANY, INC., Milford, New Hampshire

Grinders have changed . . .

IT'S TIME YOU CHANGED GRINDERS

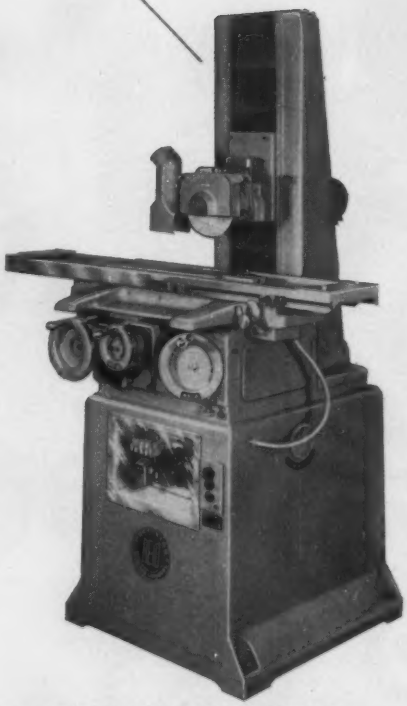
REID GRINDERS

built in '54 offer more improvements . . .

. . . improvements you can't afford to overlook, if your toolroom is to meet today's precision tooling demands—competently, quickly and profitably.

Finger-tip level controls for easier operation; one-piece column casting mounted *on* the base for maximum rigidity; hand-scraped ways for accuracy; telescoping dust plates for protection of vertical and cross feed mechanisms — these are but a few of the many improvements designed by our engineers to make Reid Grinders a standard of precision and dependability.

If your toolroom still harbors a surface grinder like those above, for the sake of efficiency,



PLAN NOW FOR REPLACEMENT!

Condensed specifications — Model 618V
Capacity: 6" x 18" x 17¼" (spindle center to table)
Work table: 51" x 8"
Power-feed table: variable, 12 to 35 ft./min.
Standard wheel: 7" x ½" x 1¼"
Weight: 2100 lbs. Floor space: 71" x 43½"

see our catalog in MACHINE TOOL CATALOGS or write for copy

Please request Catalog 618-1

Reid Brothers Company, Inc

indicates the need for a personnel director. No mention is made of the widely used plan of cooperation with public schools under a plant as follows:

In South Bend, Ind, for example, the public schools employed a coordinator who works both with the industry employing apprentices and with the local public school system. First, a job analysis of the trade is made and text references are included.

Approximate time schedule is agreed upon with the employer. The related instructional material is organized in lesson-sheet form and made available to the apprentice in a laboratory in the public schools. The apprentices assemble in this laboratory under the guidance of an instructor who is an experienced tradesman, working with the coordinator and a teacher-trainer. Each apprentice starts with an initial instruction sheet and a workbook and sets down his answers. If he is in doubt, he may consult with the instructor. Often consultants are brought in from industry. Reference books are available, as well as various tools for checking results of work. Each apprentice can thus work at his own speed. Tests are given whenever they are found to be helpful.

The work of the instructor is often supplemented by a foreman from the employing plant, whenever that will be helpful. The instructor is licensed by the state and can easily handle 16 to 20 apprentices. In Indiana, instructors are usually paid $3.00 to $4.00 per hour. Assuming 144 clock hours of instruction a year are given, the instruction would cost $576.00 per class, or 36¢ per student hour. The cost is borne by local, state, and federal funds in the following proportion:

Local	80%
State	6%
Federal	14%

Note that the related studies are planned and carried out, entirely, by the public schools and not by the Apprenticeship Service as you indicated on page 132, item 7. The agreement as to this division was made public immediately after the Fitzgerald Act was passed in 1937.

H G McComb
State Director of Trade and Industrial Education and Distributive Education
Indianapolis, Ind.

Hell's Loose

Under the heading, "It Eats the Pipes," (AM—Mar 15 '54, p177) is direct proof that we need a revision in our English courses, so people may learn to use words conformable to a man's understanding. The expression, "It eats Hell out of the pipes" is certainly more to the point of a plumber's understanding than the words actually used in reply to his query. If I were to receive a letter stating, "Hydrochloric acid generates a toxic and noxious residue which will produce submuriate invalidating reactions," I would be inclined to reply: "What in Hell are you driving at?"

John Homewood
Burbank, Calif

Pen Pal

Hoping that I don't steal your precious time, I should like to apply to you with a little desire.

I should rather like to correspond with a young man of my age in America who is interested in mechanical sciences. I am 20 years old, have just finished my practical improvement, and want to study mechanics.

It would be very kind of you to arrange a correspondence.

M Gruschka
Langemarckstr. 349
Bremen, Germany

for Special Service on Carbide "Specials"

GORHAM

GORHAM

GORHAM

When your production machining problem dictates the use of special carbide tooling, your nearby Gorham Field Engineer can give you the right answers fast! He's an expert in the design and application of special cutting tools . . . and he provides a complete engineering service to determine your exact requirements.

He begins with your product, sketch or idea. He surveys your production operations and available equipment. He considers work material properties and required finishes and tolerances. He plots speeds, feeds and methods of tool driving. Then he develops practical design and metallurgical specifications for a special tool that's "tailor-made" for your application. And his recommendations are backed by Gorham's more than thirty years' experience in the design, manufacture and heat treatment of fine cutting tools.

Yes, your nearby Gorham Field Engineer is a helpful man to have around! If you haven't yet met him, write for his name, or send details of your problem direct, and we'll have him get in touch with you promptly.

Gorham TOOL COMPANY

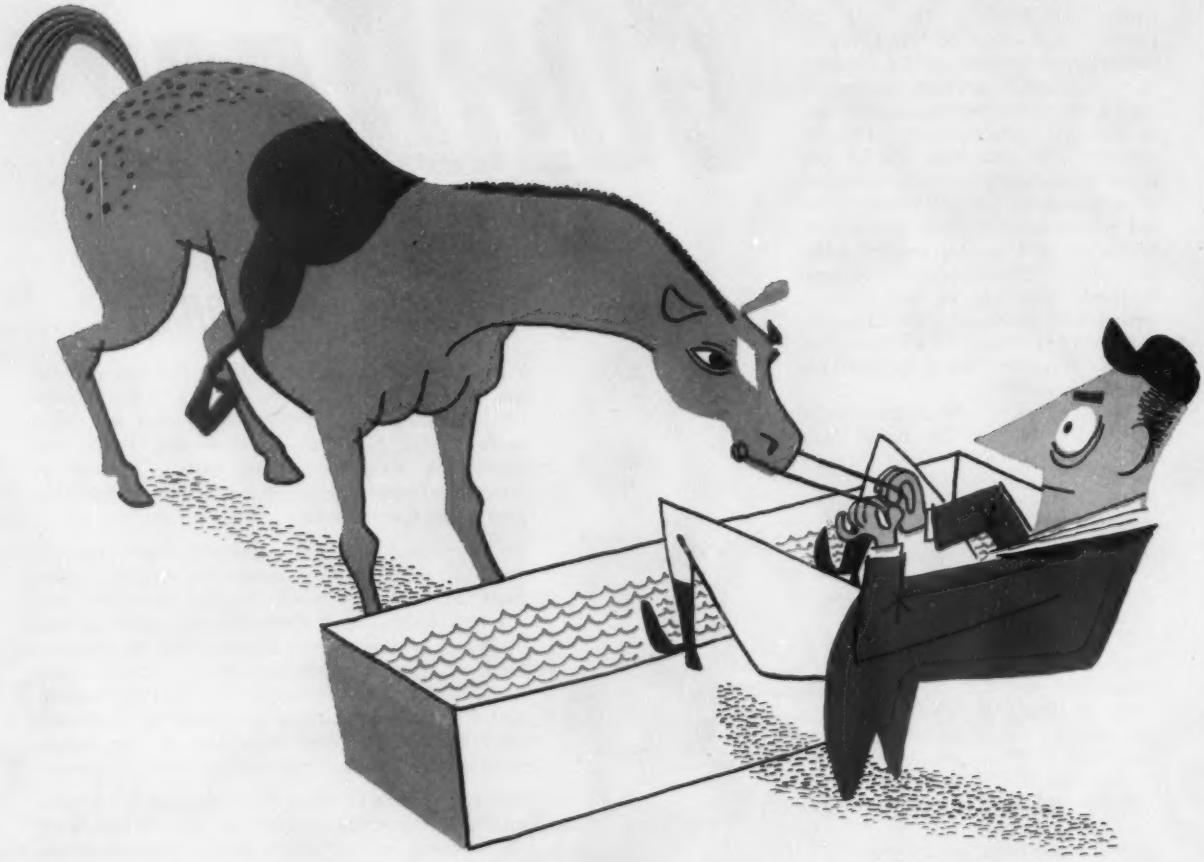
"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14408 WOODROW WILSON • DETROIT 3, MICHIGAN

WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

These familiar words can tell you where in Metalworking your advertising dollars buy the most in advertising value:

you can lead a horse to



put the power of Metalworking's great sales builder . . .

ABC ABP

water, but you cannot make him drink

As a modern advertiser to America's biggest industry, the ancient author of a deathless proverb might well now say:

> *"You can send a metalworking magazine to a metalworking production executive . . . but you cannot make him read it."*

There is, however, *one* metalworking magazine a great and constantly growing number of production-responsible metalworking men *do* read . . . and put their money up as evidence of their reading interest.

This magazine is *American Machinist* . . . and alone among *all* metalworking publications, the concentrated, purposeful *helpfulness* of its editorial pages draws a completely voluntary, self-elected audience of all-paid subscribers.

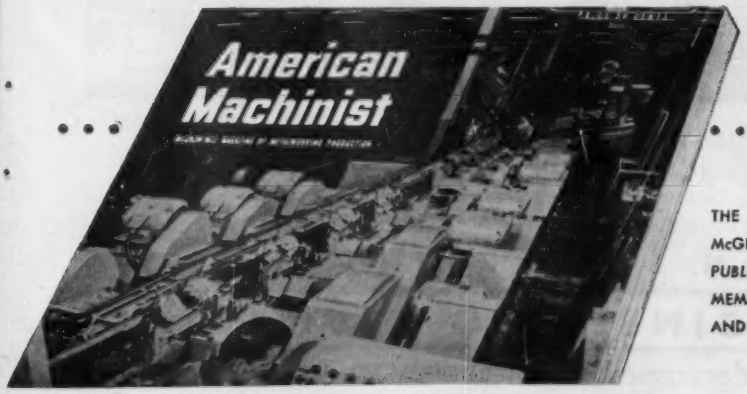
It also happens to be the *biggest* subscriber audience in the history of metalworking magazines. By ABC audit, it numbered 33,000 last December, and reached 34,058 this May (subject to audit by ABC).

So if your answer to *this* question:

"Do we want to do business with Metalworking's production executives?" is *"Yes"* . . . then it makes sound, good sense to *make sure* your product story is told most often, and most fully, in the pages of Metalworking's most powerful and sought-after editorial force.

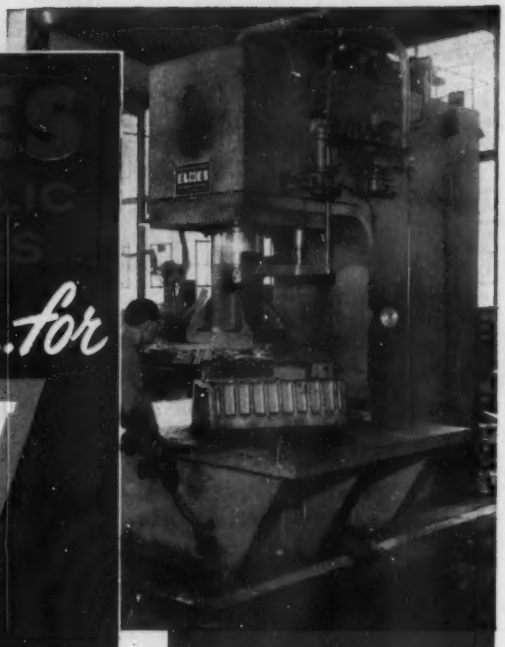
You'll find yourself in the best and most sales-minded of company when you do. Over 900 advertisers currently place more advertising for the products used and bought by Metalworking in *American Machinist* than are placed in any other magazine.

And what a market this advertising sells! For the kind of men who read *American Machinist* are producing $95-billion of metalworking products this year . . . and *buy more* to do so than any other group in industry.



. . . *behind your products*

THE McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
McGRAW-HILL BUILDING, NEW YORK 36
PUBLISHED EVERY OTHER MONDAY
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS
AND ASSOCIATED BUSINESS PUBLICATIONS



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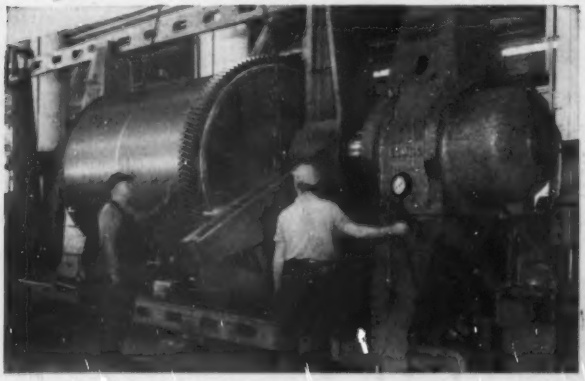
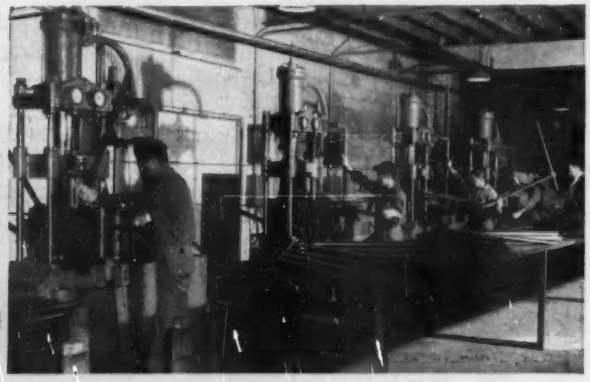
Write for Elmes Bulletin No. 1010-B "Hydraulic Metalworking Presses."

See your Elmes Distributor or write to us direct



ALLIANCE MACHINE CO., ALLIANCE, OHIO.
"Our Elmes 500-Ton Inclined Forcing Press makes possible 50% savings in costs of gear installations on crane hoisting drums." (Illustrated—hoisting drum for 400-ton ladle crane.)



JAMES STEEL AND TUBE CO., HAZEL PARK, (DETROIT) MICHIGAN.
"Four Elmes Tube Bending Presses produce 2000 tailpipes per 8-hour shift. Each tailpipe requires seven bends."

AMERICAN STEEL FOUNDRIES

ELMES ENGINEERING DIVISION

hydraulic presses and equipment .... 1161 TENNESSEE AVE., CINCINNATI 29, OHIO

Spot News of Metalworking...

• AUTOMATION IN BRITAIN ...

Rolls-Royce's new jet engine plant at East Kilbride, Scotland, has (1) subassembly lines for components that feed into main assembly line, where engines move station-to-station, and (2) fully automatic system for moving engines, materials, parts, scrap, etc. Little carts hook into continuous underground chain conveyor belt, ring a bell for pickup when they reach destination.

• CHIP DISPOSAL ...

Chips from 381 automatic screw machines at McQuay-Norris Mfg Co's St Louis Ordnance plant are carried by chain conveyors to swivel-mounted chutes that can deposit chips in either of two conveyors, according to metal.

• TANK SPECULATION ...

Upcoming contracts for M-48 tank output may: (1) find Chrysler reopening its Newark, Del, tank plant if Chrysler can underbid GM's Fisher Body, and (2) Ford, former M-48 producer, out of the picture altogether. Reason: when Ford phased out months ago, it mothballed its machine tools and converted its Livonia, Mich, plant to automatic transmission production. Detroit sources say Ford won't bid unless pressed by the government.

• CARBIDE...

Tungsten-free, cobalt-free carbide cutting material developed by Firth Sterling Inc, Pittsburgh, uses titanium carbide as a base instead of cobalt carbide, nickel as a binder instead of cobalt, and molybdenum carbide as an alloy carbide addition. Claims: high-wear resistance, reduced cratering action, excellent tool life on steady finishing cuts, cooler fluidless cutting of steel.

• NAVY GAS TURBINE...

Packard has been awarded a contract to design and develop a new gas turbine for the Navy. Already in the works for 18 months and soon ready for tests, the turbine reportedly will have high shaft-hp, economic fuel characteristics, long life between overhauls, can easily be mass-produced.

• BRITISH MACHINE TOOLS FOR USSR...

Britain's Board of Trade is considering 150 applications for licenses to export about $75 million worth of machine tools to the Soviet Union. To date, 16 licenses have been okayed.

• JET BLADE ALLOY...

Nickel-base alloy developed by Pratt & Whitney Aircraft, designed for turbojet blades, at 1500 F resists fatigue, creep, rupture and other variables; produced 10% thrust increase in test turbojet. Waspaloy is available to other jet manufacturers on free license from Pratt & Whitney.

• NEW TOOL MOTHBALLING WRINKLE...

Dehumidified building-within-a-building is being considered at one defense installation to house mothballed machine tools in an atmosphere completely moisture-free and rustproof.

The operator brings the rotating lapping stone into contact with work centers to correct inaccuracies.

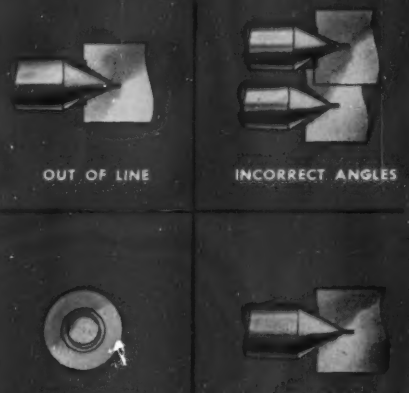
EX-CELL-O

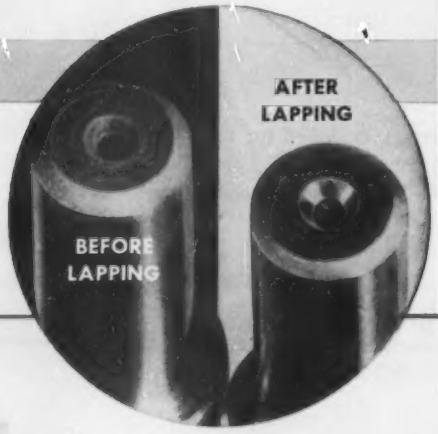
CENTER LAPPING MACHINES

FOR GREATER PRECISION IN SUBSEQUENT MACHINING

Meeting today's precision standards requires careful checking of every phase of the job, *including the center holes in the work.* Ex-Cell-O Center Lapping Machines correct inaccuracies of center holes, thus contributing to greater precision in all subsequent operations performed between centers. These machines are precision built and are easy to operate. The lapping stone is dressed to a 60° angle by a hand operated diamond dresser. An adjustable dresser for other angles also is available. These machines are fully described in Bulletin 40271—a copy is yours for the asking.

Eliminate out-of-line, out-of-round, and incorrect angles by Center Lapping





EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

XLO
EX-CELL-O for PRECISION

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
DAIRY EQUIPMENT • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS

53-44

Washington . . .

Fast amortization is now part of the tax laws. This is the meaning of Congress's approval of the new tax revision bill. House-Senate conferees agreed to give corporations incentive of writing off two-thirds of the cost of new plant and equipment in one half the useful life. New deduction applies to all money spent for machinery and equipment beginning January 1 of this year.

New provision frees $375-million on company books for spending on such equipment, which otherwise would have to be paid to the tax collector. For machine-tool salesmen, it means only an opportunity to make a sale; company officials can sock this saved-money away if they choose to.

• • •

The exact level of military spending for the next 12 months is now being settled by the administration, with indications that it will be around $37.5 billion. This would be about $2 billion less than was spent in the last year.

The budget balancers in the Eisenhower Administration—notably Secretary of the Treasury George Humphrey—are pushing hard for a greater cut, and may get it. Decision will have to be made within the next few weeks.

• • •

Meantime, the brake on new contracts for hard goods imposed by the Pentagon is being eased off. During the past year, the Air Force fell some $2.6 billion short of its normal rate of contract-letting while top brass figured out what the "New Look" would really be.

Officials admit they can't catch up, but they do say they have about $1 billion in new contracts for new aircraft to pass out within the next couple of months. A big chunk of this will be for the North American F-100 Supersabre jet fighter. This fits in with the new contracts extending production of tanks, self-propelled guns, and other armored vehicles by General Motors and Food Machinery and Chemical Corp.

• • •

Long-range, Pentagon officials are considering washing out their planned decline in spending for arms—the new look designed to give us "more bang for a buck." Indo-China situation is part of the reason. It won't affect military spending for the upcoming year, but may well offset any decline in the year beginning in July of 1955.

• • •

The Government's Elephant Tool Program may be started up again—but with a new twist. The original program was aimed to increase the capacity of elephant tool producers. The new one would involve the "stockpiling" of elephant tools by the government.

Goal of the original program was to expand the annual capacity of elephant tool builders by 450 machines. To do this, GSA leased 308 tools to three firms, and ODM granted accelerated tax amortization to another. But other elephant tool builders have displayed no interest in the government's program. Net result is an estimated increase in capacity for only 203 elephants out of the 450-machine goal. An ODM production equipment official calls this "only moderately successful."

The new proposal—made by some machine tool makers through BDSA—would have a different approach. As it shapes up now, the government would buy tools, then store them in regular machine tool plants. The new scheme would be patterned after the government's standard facilities expansion program for the machine tool industry. ODM has asked BDSA to work out details on the proposal by September.

• • •

The House Committee on Government Operations has concluded hearings on some bills to end or limit government activities that compete with private business. Over 100 government operations were cited as competitors with private firms. Among these were chain manufacturing, automotive repair, and ship repair. It's unlikely that the hearings will produce anything in the way of new legislation.

But the Committee evoked statements from administration officials that government is speeding up placement of contracts and production in private firms that was previously performed by the government itself. A Presidential directive is being drafted requiring all agencies to make an inventory of commercial-type operations that might be handled more economically by private business.

• • •

The House has voted $82.6 million for a ship and tanker construction program. The Appropriations Committee had previously allowed only $11 million for construction or renovation of liberty ships on an experimental basis to serve as a pattern for future shipbuilding programs.

• • •

Disregard West Coast rumors that Hughes Aircraft has incurred disfavor of Air Force either in its research and development or production contracts because of mass exodus of Hughes management team. Hughes Aircraft is engaged in electronics research and in producing fire control equipment and guided missiles. Hughes has the prime contract for the Falcon, the Number One air-to-air guided missile being built for the Air Force.

Continuous Operation High Production Accurate Flat Surfaces

No time lost in loading and unloading parts on new Model 844 Microflat Machine.

New type multiple-station, self-actuated fixture and more selective controls give this machine a production capacity of a finished part every 3 seconds.

For complete description of this new Microflat Machine write for CROSS-HATCH, Vol. 6, No. 1.

1929 • 1954 — PRECISION PRODUCTION THROUGH MICROHONING — MICRO MATIC — 25TH YEAR OF DEVELOPMENT

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Micro-Precision Inc., 2205 Lee Street, Evanston, Illinois

Hydraulic Controls • Diesel fuel injection equipment

Detroit . . .

Anything but clear all year long, the automotive outlook was becoming even murkier in late July.

Total 1954 car and truck production was running high: going into August, about 4 million units will have been assembled.

Great and good times were assured for General Motors, which at last count by *"Ward's Reports"* had racked up 51.65% of total car output, and Ford (31.28%).

But for Chrysler, down to 12.8%, there was no prospect of sunnier days for at least three or four months.

• • •

The corporation recently advised dealers to stock up sufficiently to carry them through model changeover periods. Then, aware that some dealers were tipping off reporters, Chrysler issued a statement which, while not confirming reports that various production lines would be down six to seven weeks, did say that new models would be introduced in "late fall"—meaning November.

Plymouth would go down first, beginning in the second week of August. Dealers, accorded the privilege—in these days—of taking delivery on only the units they specifically ordered, without having stocks pushed on them by the factory, certainly should have no trouble in cleaning up inventories, with '54 production beginning to phase out in August and '55 models not scheduled for introduction until November. That is if late fall introductions are planned.

Not too long ago, a top official solemnly told newsmen Chrysler's lines would not be out until January — that in rebuttal to reports earlier this year that the cars would be out to the public in late summer.

The model changeover, running concurrently with annual inventory periods, means staggered layoffs for about 41,000 of Chrysler's 107,000 employes.

A wildcat strike at Dodge accompanied Chrysler's announcement, prompted, said union local officers, because of speed-up, etc. CIO auto workers' international officers instructed UAW members to return to work, but three days after the strike began, the bidding had been ignored and about 35,000 workers were idled.

The long model changeover period is necessary, according to a Chrysler spokesman, because all of the 1955 models are so completely altered stylewise. But 1954 sales, as against those of 1953, are completely altered, too—giving added reason for a prolonged shutdown.

Retail car sales through May of this year were about 318,000, as against about 490,000 for the same period last year. Total Chrysler car production through mid-July of this year came to about 409,000, as against 763,000 a year ago.

The extended shutdown is apt to revive an old union-management argument: the auto workers' union from time to time has protested long model changeovers, charging that management is capable of switching to new model production very quickly when sales are high.

That has been generally true in cases where only facelifts have been accomplished on new models. Downtime for Ford Div changeovers over the past four years has ranged from only two to six days. Last year, Lincoln-Mercury's last '53's came off lines on a Friday and the first of the '54's began rolling out the following Monday.

Chevrolet and Cadillac last year were down three weeks. Olds, which made extensive styling changes, was down 10 days. Nash perennially combines changeover with the two-week vacation period, the company reports, so that layoffs for changeover have been out since WWII.

But if UAW chooses to belabor that point, Chrysler can point to several public blasts made by the union late last year, when UAW accused Chrysler of bringing about layoffs because of "reckless and irresponsible over-scheduling of production during the first half of 1953."

There is no evidence of "reckless over-scheduling" by Chrysler this year. Dealers, not obliged (according to the company) to accept unwanted cars, saw to that.

• • •

GM's experimental gas turbine is impractical for use in autos. Maybe that's just as well, considering the Firebird's potential speed.

The ultra-streamlined vehicle, says a GM spokesman, was engineered and designed to achieve a top speed of 270 mph. The lower-powered turbines installed by Chrysler in a couple of Plymouths will move the cars at 90-100 mph.

• • •

Aluminum's growing importance in automotive applications was stressed by Aluminum Limited of Canada.

According to company officials, the average auto today contains about 40 lb of aluminum, in the form of pistons, parts for automatic transmissions, power steering units, etc.

Said one company officer: "We have hopes that aluminum components in cars soon will amount to about 150 per vehicle."

View of the aluminum people is that if auto companies continue to harp on power-to-weight ratios, and yet continue to build more weight into their products—powered steering, air conditioners, power brakes, etc.—then front ends will have to be lightened in some way.

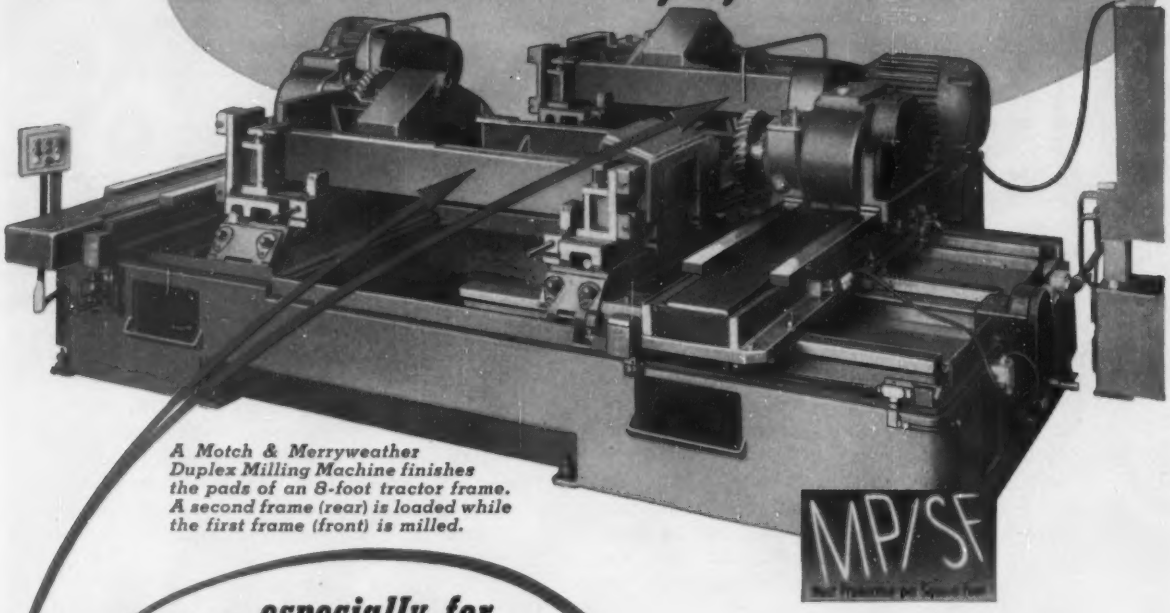
Aluminum, they say, is the answer.

Another Duplex Milling Machine

BY MOTCH & MERRYWEATHER

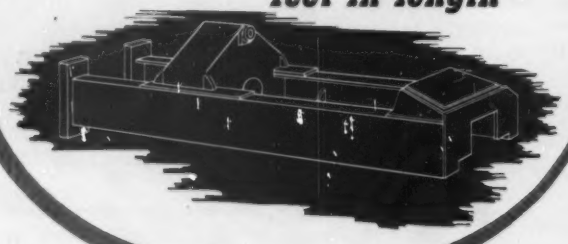
Fifty Years 1904 • 1954

STANDARDIZED TRAVELING HEAD DESIGN is adapted to *Many Specialized Jobs*



A Motch & Merryweather Duplex Milling Machine finishes the pads of an 8-foot tractor frame. A second frame (rear) is loaded while the first frame (front) is milled.

... especially for Large Parts 6 feet to 11 feet in length



Again using the facility of *traveling milling heads* instead of traveling fixtures, Motch & Merryweather creates greater universality; saves time, original cost and floor space. Standardized design enables duplex operation to dispatch a wide range of work with money-making speed and accuracy. Simplified fixturing is readily adjustable to handle parts of varying size. May we study your requirements?

THE MOTCH & MERRYWEATHER MACHINERY CO.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Builders of Circular Sawing Equipment, also Production Milling, Turning, and Special Machines

Machine Tools . . .

Machine tools are at the core of a new plan for industrial mobilization that differs somewhat from the Vance Plan.

The plan is to have ready for a war emergency the machine tools necessary to produce critical components for military end-items in sufficient quantities to meet the needs of the armed services for three years.

• • •

These components would be special pumps, turbines, electronic gear, boilers and the like. Office of Defense Mobilization figures that there are serious deficiencies in the capacity to produce at least 32 specific industrial components and 20 types of electronics equipment.

Among the deficiencies: Aircraft instruments, high-pressure boilers, fractional horsepower motors, gyroscopes, heat exchangers and condensors, hydraulic couplings and precision fasteners.

• • •

General Services Administration would buy machine tools for this program, but actual selection of the make of the machine and the ordering would be done by the contractor, with BDSA blessing.

Financing of the program would be through the Treasury Department's borrowing authority set up by the Defense Production Act. About $1 billion is still available for mobilization purposes.

• • •

No one knows at this point exactly how much money would be spent for machine tools. But it might easily run to $200-$300 million over a period of time.

The tools ordered would mostly consist of the heavy long-lead-time type contemplated under the Vance Plan. The program would, in effect, be a practical application of the Vance principle.

But the plan and the money involved would have nothing to do with the $100 million included in the Defense Department's 1955 budget for long-lead-time machines. Pentagon has separate ideas for spending that sum.

• • •

The new plan is not a sudden creation. It has been the subject of long discussion by an interdepartmental committee comprised of representatives of various Washington agencies. But it was mainly sparked by ODM.

Initial test of whether the plan actually will develop into something big will come when the first project is pushed through: enlargement of capacity to make high-pressure boilers. This project incidentally does not include any metal-cutting machines.

New orders for machine tools turned sharply upward in June, bearing out the prediction in this column. The NMTBA index registered 186.8 or 47 points above the May figure.

It was the best month for new orders since October 1953. It was caused by the placing of a large volume of defense orders prior to the end of the 1954 fiscal year.

Machine tool shipments rose slightly in June. NMTBA index stood at 277.8, compared with 270.3 the previous month. Backlog for the industry is now down to about 3½ months, lowest since Korea.

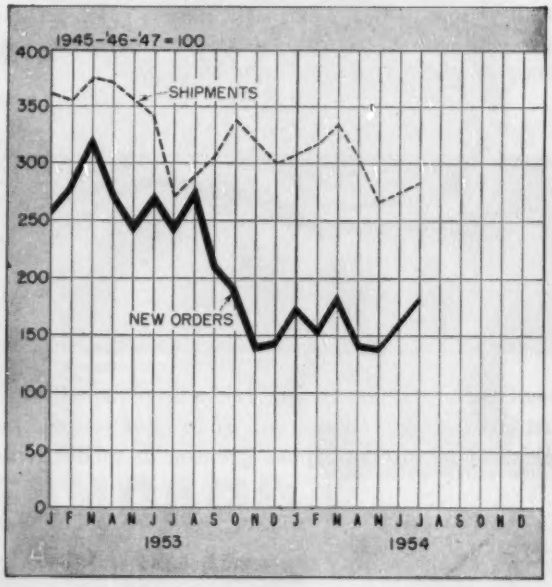
• • •

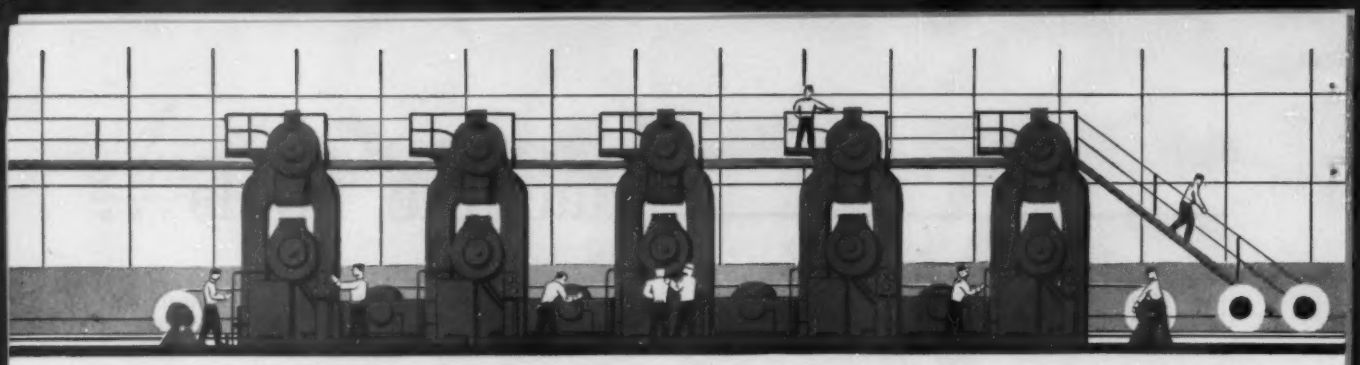
Graham E Marx, vice president and general manager of the G A Gray Co, Cincinnati, has been appointed director of the Metalworking Equipment Division of the Business and Defense Services Administration, Department of Commerce.

He succeeds Ralph E Cross, who has assumed his duties as deputy administrator of BDSA. Norton Booz, chairman of the Federal Machinery Sales Co, Chicago, has been acting director of the Metalworking Equipment Division the past few weeks.

MACHINE TOOL INDEX
(1945-47 = 100)

(Source, National Machine Tool Builders' Assn.)





Now! cut application costs and grease inventories with

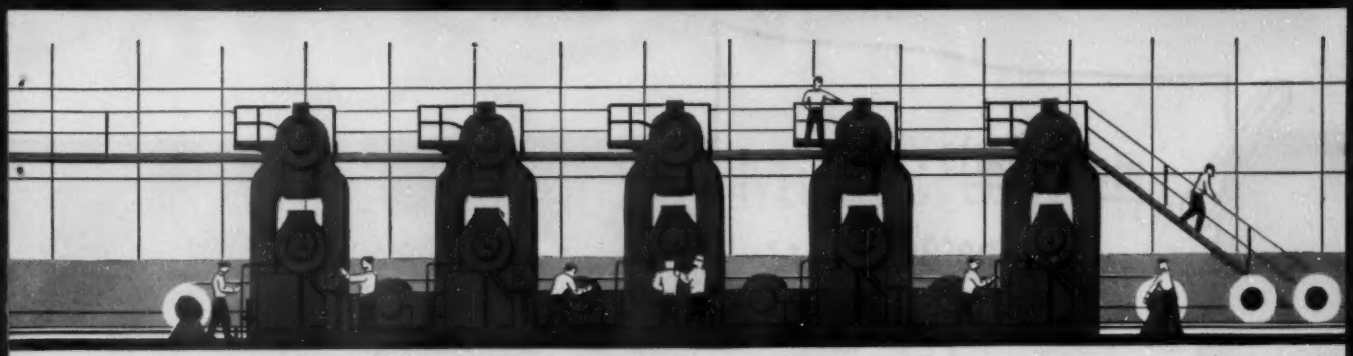
NEW STANOLITH GREASE MP

Here is a newly formulated grease with such an increase in multi-purpose range that it helps you *cut application costs and reduce grease inventories.* Higher oil viscosity and greater extreme pressure properties make it suited for wide use in steel mills, cement mills, rubber mills, mining operations — all other heavy equipment industries.

More than just an "E.P." grease, New STANOLITH MP has all of the outstanding properties of STANOLITH greases: excellent oxidation stability and good mechanical stability. It has extreme water resistance and withstands high temperatures — *it will not thin out.* For better protection of all kinds of heavy equipment, under a wide range of conditions, use STANOLITH Grease MP.

Call your nearby Standard Oil lubrication specialist and let him show you how Standard's "multi-purpose" greases can save you money and help you avoid trouble.

New STANOLITH Grease MP takes its place with famous STANOLITH Greases No. 42 and No. 57 to give you the most versatile collection of multi-purpose greases in modern industry.



You need only this *one* grease for many kinds of heavy equipment!

Added high-load carrying capacity!

Resists both water and high temperatures!

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more parts...
more operations...
PER HOUR

with...

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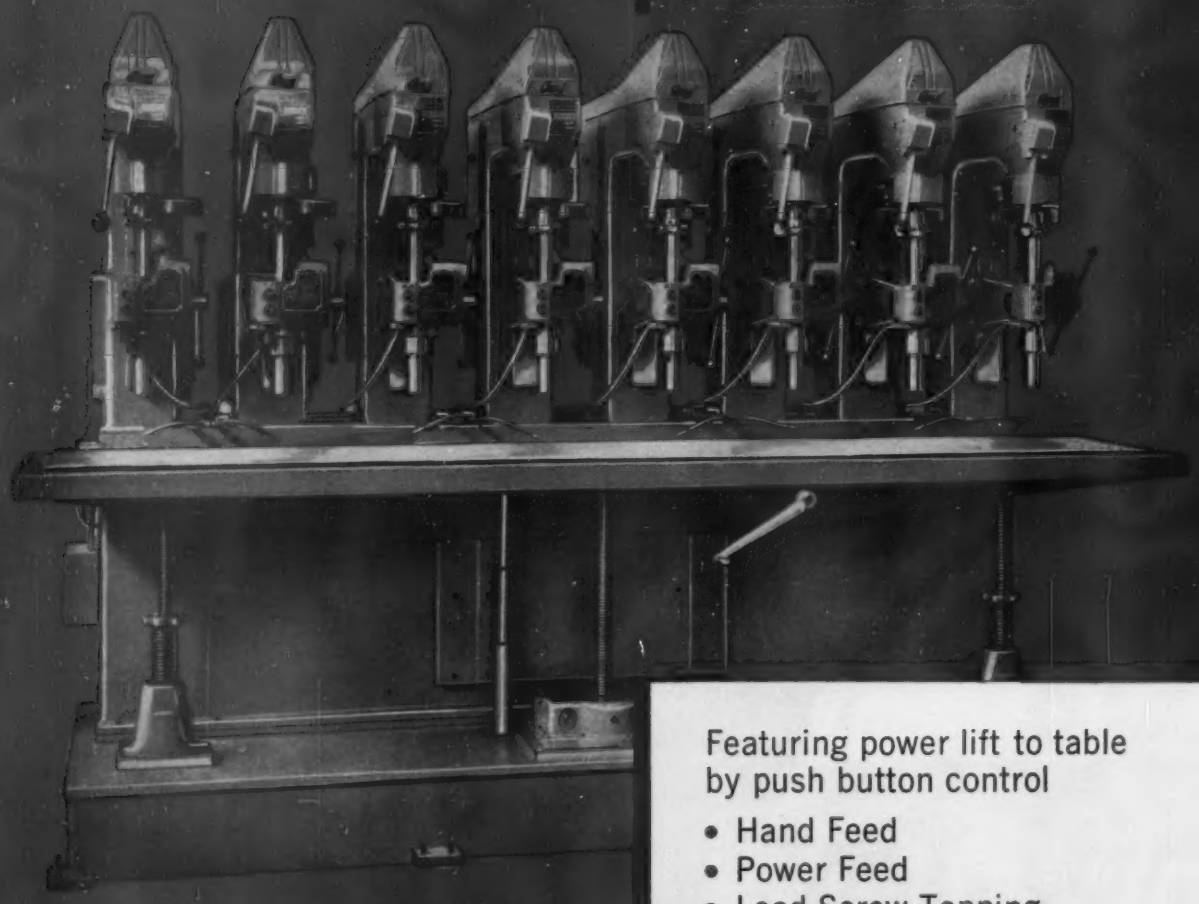
No. 2 BMA-6
DRILLING MACHINE



Featuring power lift to table by push button control

- Hand Feed
- Power Feed
- Lead Screw Tapping
- Four Feeds
- Six Speeds
- Built-in Coolant System

for drilling... tapping... production machines

Avey

THE AVEY DRILLING MACHINE CO., Cincinnati 1, Ohio

Gaging Metalworking . . .

PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JULY '54(*)	JUNE '54(p)	MAY '54(r)	JUNE '53
Tot. Index...	**144**	**146**	**147**	**168**
Machinery	**124**	**124**	**144**	
Electrical Machinery	**168**	**163**	**194**	
Autos	**104**	**106**	**131**	
Other Transportation	**286**	**296**	**288**	
Other Metalworking	**125**	**124**	**142**	

(*) Estimated (p) preliminary (r) revised

Wholesale vacation shutdowns of metalworking plants have cut into production volume in the past month. Many companies have closed up tight for 2-3 weeks at a stretch.

Steel deliveries have suffered as a result. And so have deliveries of all sorts of components.

"Hold" orders were given suppliers. Though plants were closed in 1953 and 1952, receiving departments stayed open to take in materials. But not this year.

• • •

August is likely to bring a pickup in production, as July is believed to be the main vacation month. Even so, no records will be set the rest of the summer.

Make no mistake on one point: By any other standard except the super-boom of last year, metalworking business this summer is extremely good.

Production in particular is doing very well. It continues to outstrip sales—and therein is the rub.

This out-of-balance between output and orders holds in practically every segment of Metalworking.

But the two are getting closer together than in many months. And that is a favorable sign.

• • •

Defense business is not to be sloughed off. It will be a powerful factor in Metalworking in the coming months.

Take the case in the automotive industry as a sample. Some $266 million is to be placed, representing an extension of Ordnance contracts for combat and tactical vehicles.

• • •

Prime aviation parts makers, too, are running at a high rate. They expect to continue without any slump through at least the balance of the year.

Some of the aviation parts shops worked their first shifts during the vacation period. What's more, they have been operating and will continue to operate two full shifts. Engineering departments of these companies are very busy.

• • •

High inventories still are partly responsible for production of consumers' goods not being higher. Nevertheless, retail sales and output are showing an ecouraging vitality.

Household vacuum cleaner sales, for example, were down 6.5% in June as against May. But they were almost equal to June of last year.

• • •

Farm implement production has been curtailed further because retail demand has been less than anticipated. Automobile assemblies will dip considerably the next month, what with Chrysler closed down tight and other car makers getting ready for new-model manufacture.

• • •

Contract tool and die shops report to the National Tool and Die Manufacturers Association that backlogs continue to slip.

For the year through May, production was 88% of last year's. Employment has held steady but hours are off a bit.

NTDMA members polled on the outlook responded as follows: five view the future as excellent, 37 as good, 48 as fair, and 10 as poor.

Detroit district shops are loaded with work for 1955 new-car models.

• • •

Railroad freight car and locomotive business is in the doldrums. One big diesel-electric locomotive building plant was idle all of July.

Gaging Business . . .

PRICE INDEX

	JULY '54(*)	JUNE '54(p)	MAY '54(r)	JUNE '53
Total Index	**132.4**	**132.4**	**132.4**	**130.9**
Metalworking Machinery	**141.6**	**141.6**	**140.2**	
Other Machinery exc. Electrical	**137.5**	**137.5**	**135.0**	
Electrical Machinery	**131.1**	**130.1**	**129.3**	
Fabricated Metal Products	**128.8**	**128.7**	**127.8**	

(*) Estimated (p) preliminary (r) revised

Gross National Product (value of all US goods and services produced) is estimated at $355 billion in second quarter 1954.

This represents a $15 billion drop from second quarter 1953's all-time peak.

• • •

GNP may have been off from 1953's high, but consumer expenditures hit an all-time peak in this year's second quarter.

Oddly enough, consumer goods spending was off slightly from a year ago. But spending for services more than made up for it.

• • •

Business inventories declined in the second quarter at an annual rate of nearly $5 billion. This reflected a continuation of business's readjustment of its excessive inventory accumulation of a year ago.

• • •

Industry's brightest star—construction—is running 2% ahead of a year ago. New contracts are coming in all the time, too.

In May, personal income was running at an annual rate of slightly over $285 billion—$800 million over April's rate, but more than $1 billion under May 1953's income.

Factory payrolls were on the upgrade in May, for the first time since last July. The gain reflected an increase in the workweek.

• • •

McGraw-Hill's Index of New Orders for Machinery (except electrical) rose 18% between May and June (see p158).

• • •

Unemployment held steady in June, instead of rising 300,000 as expected. But this was about 1.8 million more unemployed than a year ago.

And the number of unemployed is expected to go up considerably in July—perhaps to 3.8 million. This is largely seasonal.

Employed people totalled 62.1 million in June—1 million more than in May but 1 million less than in June 1953. Largest gain was in farm employment.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	124.2	124.4	135.7
Steel ingot operation (thousands of tons)	1,573	1,534	2,128
Electric power output (million Kilowatt hours)	8,951	8,185	8,209
Production of automobiles and trucks	131,163	106,169	175,599
Engineering construction awards (*Eng. News-Record*—millions)	$259.3	$431.1	$253.5

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949 = 100)*	124	124	136
Index of durable manufactures production (1947-1949 = 100)*	135	135	154
Durable goods manufacturers' sales, millions*	$11,371	$11,502	$13,148
Electrical machinery manufacturers' sales, millions*	$ 1,324	$ 1,305	$ 1,437
Other machinery manufacturers' sales, millions*	$ 1,868	$ 1,939	$ 2,156
Durable goods manufacturers' new orders, millions	$10,144	$10,021	$13,101
Electrical machinery manufacturers' new orders, millions	$ 1,163	$ 1,049	$ 1,480
General machinery manufacturers' new orders, millions	$ 1,602	$ 1,705	$ 2,042

*Seasonally adjusted

Tool Grind is the Secret, *says Stainless Sam*

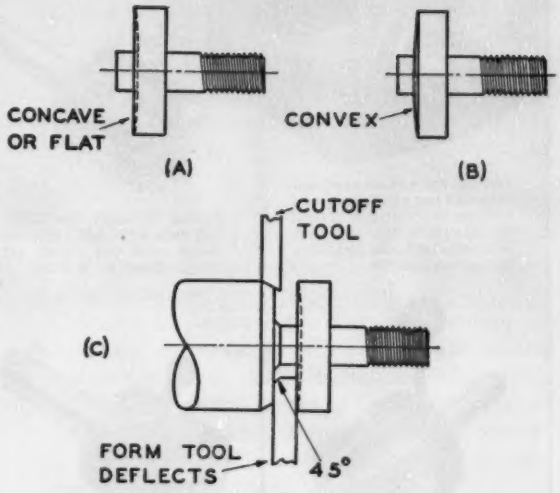
Problem No. 1

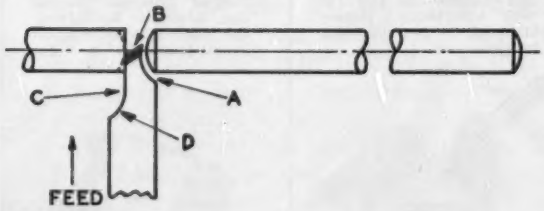
A threaded stud made on a turret lathe from 1-inch diameter round Type 416 stainless steel was required to have a slightly concaved or flat face as shown in drawing A.

However, when the part was formed with a narrow form tool before the cut-off, a slightly convex shoulder resulted, as shown in drawing B. This was not acceptable because of assembly requirements. Stainless Sam decided that the condition was probably due to end play in the spindle bearings.

Solution No. 1

Stainless Sam's solution was simple. He ground a small 45-degree angle on the form tool. This caused a side pressure on the tool and produced the slightly concaved surface shown in drawing (C). The size of the 45-degree flat determined the amount of deflection.





Problem No. 2

A Type 303 bar, ⅜-inch in diameter, required cutting to length with perfectly matched end radii. Equipment consisted of small turret lathe and combination form- and cut-off tool.

Solution No. 2

Here's how Stainless Sam ground the combination tool. He first ground section A of the tool to required radius, permitting the tip of the tool to extend beyond center as shown in shaded section. He then ground back tip of tool until radius was correctly placed on the work-piece at moment of break off.

Radius of the stock in the collet is then cut by the other side of the tool as shown at D. However, enough idle approach was allowed at C to permit the finished piece to fall off before tool starts cutting second radius. The stop on the cross-slide is set to match the radius produced at A.

• • •

Many machining problems are discussed at length in Armco's latest edition of the booklet, "Machining of Armco Stainless Steels." Write for your copy today. Speeds, feeds and tooling recommendations will help you machine stainless steels readily with standard equipment.

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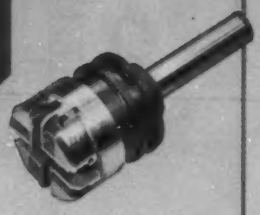
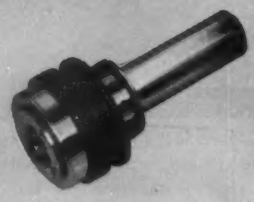
Precision-Pak with die heads and collapsible taps automatically taps holes up to 4" dia., cuts external threads up to 3½" dia.—also bores and reams. Lead accuracy assured by precision lead screw.

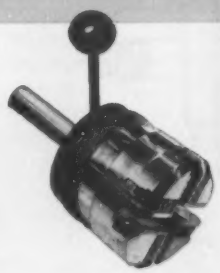


Rotating Die Heads, Type "ORB" with snap action trip and quick change radial type chasers, cut straight threads ½" to 5" dia.

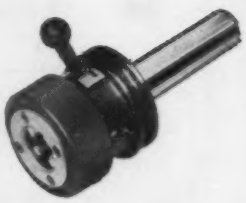
Non-rotating Die Heads, Type "OLB" with pull off snap trip and quick change radial type chasers, cut straight threads ½" to 5" dia.



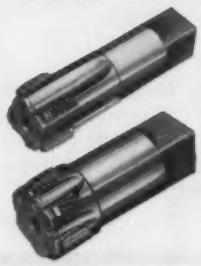
Rotating Die Heads, Type "TRB" with snap action trip and quick change Tangent chasers, cut straight threads ½" to 2" dia.



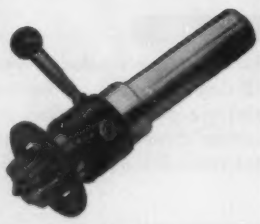
Non-rotating Tangent Die Heads, Type "TLC", with pull-off snap trip and quick change chasers, cut straight threads ¾" to 2" dia.



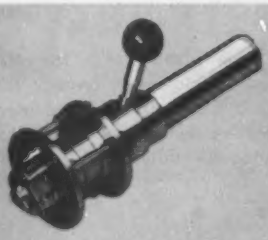
New 4 in 1 Type "ACB" Die Heads, Rotating and Non-Rotating feather action trip, cut straight threads ⅛" to 4" and tapered pipe threads ⅛" to 3½".



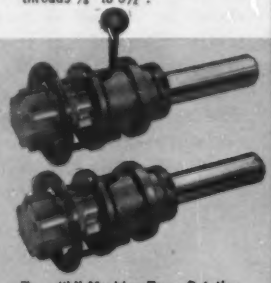
Solid Adjustable Taps "EHB" and "RHB" with removable chasers, cut threads 1¼" to 5" dia.—ideal for salvage work.



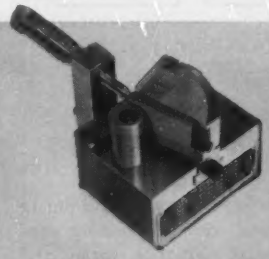
Standard Collapsible Machine Taps, Rotating or Non-Rotating, with easy size adjustment, cut straight threads 1¼" to 7" dia.



Semi-receding Pipe Taps, Rotating or Non-Rotating, with taper receding action, cut 1" to 6" taper pipe threads. May be arranged for straight threads also.



Type "L" Machine Taps, Rotating or Non-Rotating, with 18 interchangeable nose pieces and 2 bodies, cut a range of straight threads to 6¼" dia.



Tangent Chaser Micrometer Setting Fixture provides longer chaser life and better threads through more accuracy in setting chasers in their holding blocks.

Universal Chaser Grinding Fixture for use on either a surface or cutter grinder assures accuracy in grinding chasers of all types.

For more complete information on Sheffield-Murchey threading tools, get in touch with your local representative or write for Catalog MU-153.

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6548

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Metalworking—1970 Style

Metalworking has come a long way since the end of World War II.

In 1945 we were worrying about what would happen to the economy from then on. Only the hardiest optimists envisioned the sharp growth that took place in the next decade, a growth which was hastened by the Korean-inspired defense program.

Today, as in 1945, we are worrying about the same thing as then: What's ahead?

If we take the long view rather than the short one, the answer is not hard to decipher. There may be wonderment, but certainly no doubt.

This belief is brought home forcefully by a new study of the American economy up to 1970 just made by the McGraw-Hill Department of Economics. You will find a detailed account of this study on page 150 of this issue.

The study makes for exhilarating reading. Our gross national product—total output of goods and services—amounted to $367 billion last year. By 1960 it will have expanded to $415 billion. And it will have ballooned to $560 billion by 1970. This is after allowing for a drop in the average work-week from 41 hours to 35 hours.

Our population will rise by 40 million. The labor force, on the other hand, will be only 17 million larger than it is now. The result will be even more pressure to increase productivity per worker; and that means more mechanization. It is not too much to expect productivity to gain at a rate of 2½% a year (from 1930-1950 the increase was 2% annually).

To keep pace with the growth in the economy, the McGraw-Hill study estimates that manufacturing facilities must be enlarged 65% by 1970. That is in face of the fact that many people are questioning whether today we have too much productive capacity.

Capital expenditures are likely to soar to $32 billion a year by 1960, and to $40 billion by 1970. That compares with $28 billion in 1953, the biggest year up to now.

These huge outlays will be necessary to provide the plant and equipment for our 1970 economy, as well as to modernize old facilities.

Over the long run, the chances are that replacement and modernization may account for as much as two-thirds of all capital spending, the study found.

Changes in technology may well create as many new demands as will the growth in the sheer quantity of goods consumed, the study points out. A whole series of industrial revolutions are in the making in chemistry, metalworking, electronics and automatic control devices, to mention only a few.

The growth in our economy, and specifically in Metalworking, promises to be spectacular in almost all respects and from whatever angle you wish to view it.

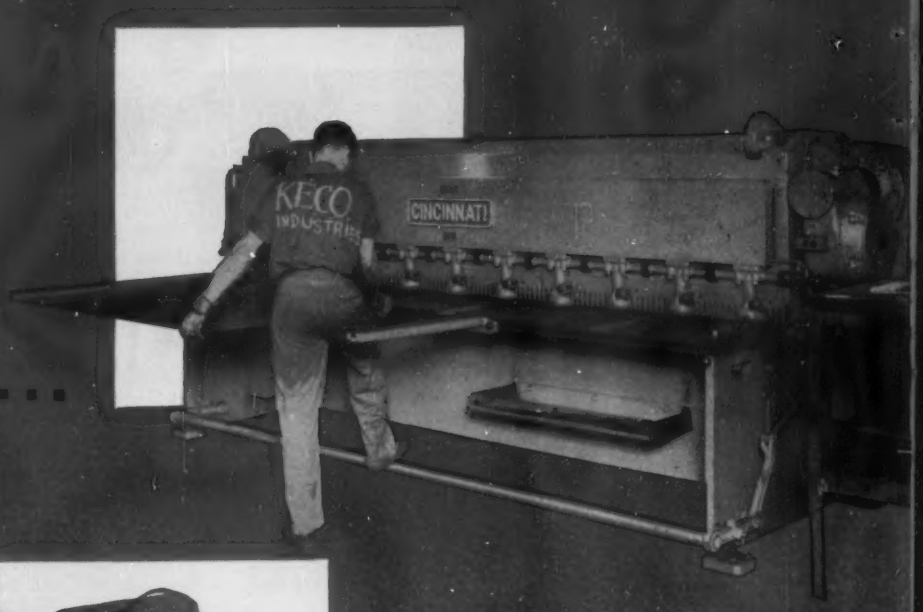
It is easy to dismiss this study as mere daydreaming. But it would be a gross error to do that. It is based on the solid foundation of the growth of the national economy in the past and on clearly discernible trends reaching into the future.

More and more companies are basing their plans on the long-range view. They realize that to do otherwise, to consider only tomorrow's conditions, might be fatal. For time has a way of slipping up rapidly on those who are unprepared.

Metalworking, 1970 style, looks from this distance like filet mignon with all the trimmings. It is not too early for you to start planning to make sure that you have a good place at the table then.

Burnham Finney

3 times as fast...



Photographs courtesy of the Keco Industries, Cincinnati 25, Ohio

with this CINCINNATI team

Cooling towers for portable air conditioning units

The floor-to-floor time consumed in shearing and forming panels for air-conditioning units, was cut from 12 minutes to 4 minutes at Keco Industries, using a Cincinnati Brake and a Cincinnati Shear.

Accuracy and rapid handling effected these savings.

In your shop, there may be opportunity for real costs reductions. Investigate Cincinnati Shears and Cincinnati Press Brakes.

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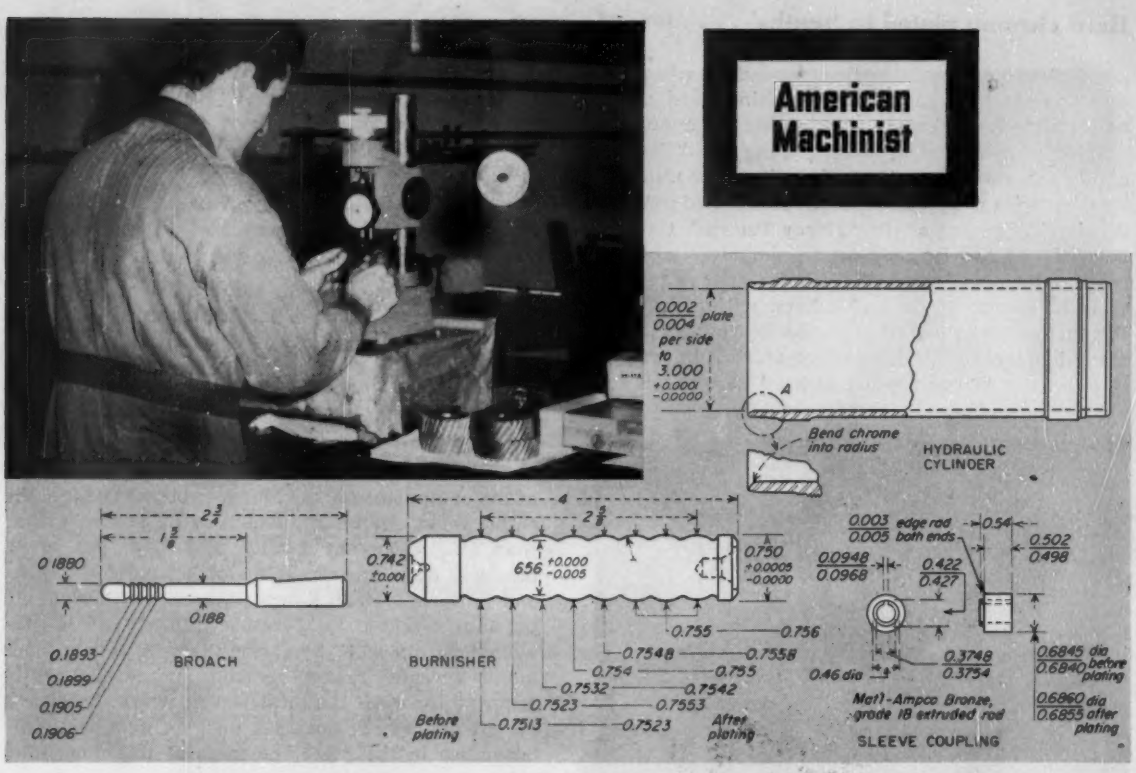


TOLERANCES WITHIN "TENTHS" are possible in hard chrome plating. Edges of involute forms, gear teeth, and threads are plated without buildup, and recesses are within gage makers' tolerances for uniformity of deposit. Typical of wide variety of appreciations are these hydraulic cylinders, broaches, burnishers, and sleeve couplings

Hard chrome can be plated to 'tenths' in production

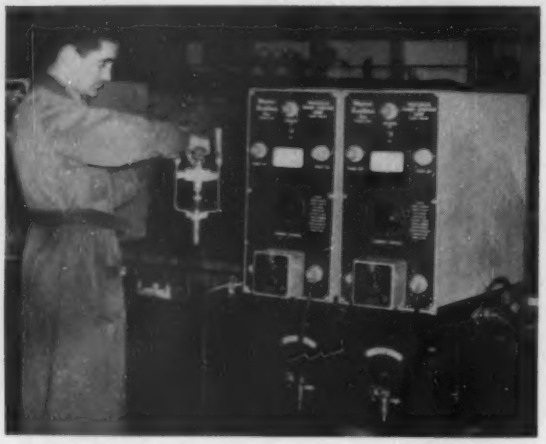
GEORGE DE MIRJIAN, president
CHROME ELECTRO-FORMING CO.
Detroit, Mich

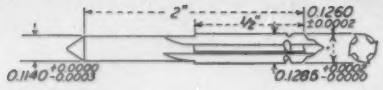
Close control of plating thickness eliminates subsequent grinding and lapping to size and provides a better plated surface. Tolerances as close as 0.0001 in. are held without conforming anodes by controlling solution temperatures, current density, and plating time. Process and equipment to precision plate all surfaces, including deep recesses on cutting tools, dies, gages, and other parts are described

Advantages of hard chromium plating to increase tool and gage life and to salvage worn and undersize parts are well known. It is not so well known, however, that hard chrome can be deposited within precision tolerances without subsequent grinding, lapping, or other mechanical operations. Actually it is no more difficult to plate a part to size within 0.0001-in. tolerance than it is to plate it oversize and then remove some of it. Of course, where tolerances must be held within millionths of an inch, as in the case of special gages, lapping is required. Besides the obvious advantage of eliminating an operation or two, plating to size produces a better surface and increased wear resistance because density of the deposit is greater at the surface than it is at the base and, of course, it is the surface that is removed in

grinding operations. In addition, grinding-wheel action tends to weaken the plate in thin deposits, so a better plate is obtained by eliminating this operation.

With proper control over plating conditions, a highly accurate and uniform deposit can be attained, together with good adherence, ductility, and extreme density. By means of the "Morey Process" this can be achieved in plating grooves, shoulders, and recesses, such as those in splined holes, gear forms, tap threads, broach teeth, and others, without etching the surface to be plated or working it otherwise. In many instances a specific surface finish is important. Because the Morey process of hard chrome plating duplicates the surface of the base metal, plating can be accomplished successfully on a finished surface without the need to disturb it for the sake of adherence. If a part is finished to 20 mu in. rms, for example, before plating, it will have this surface finish after.





CLOSE CONTROL over time, temperature and current density permits accurate plating of precision cutting tools. These stepped reamers are given 0.0003 in. of chrome on cutting dias and are plated in bottom of flutes to aid chip removal

CLEAN SURFACES prior to plating are important for good adherence of plate. Hot alkaline soap solution and reverse current removes dirt from pores. In addition, work is scrubbed with brushes in the same solution

SIX IMPORTANT FACTORS

In the Morey process, emphasis is placed on close control over time, current density, and temperature. Altogether there are six factors involved. First, the equipment must be fully integrated with tank size, power, location of anodes, and all other components properly related. Secondly, precise control of dc power is employed because it must be synchronized with the electrochemical reaction. A special selenium rectifier (designed by Wagner Bros, Detroit, builder of the equipment for the Morey process) reduces the ripple factor, or ac component of dc power, to less than 5%. A current density of 2 amps per sq in. produces optimum conditions of hardness, ductility, and uniformity with a deposition rate of 0.00001 in. per min. Solution temperature is 52 C and is controlled within ± 1° by thermostats. A synchronous motor operates timing controls and is sufficiently accurate for even the most precise work, because a minute one way or the other makes only a negligible difference in the plate thickness at this deposition rate.

The solution contains a special catalyst which contributes to exceptional throwing power, and also serves to maintain proper balance for consistant results. The sixth factor is the engineering of fixtures and racks. Considerable attention is given to this work to eliminate time-consuming masking by lacquers and waxes. Normally, masking by these means accounts for 80% of labor costs in hard chromium plating. Properly engineered fixtures and racks also eliminate build-up on edges and sharp corners of the work. The ends of plated surfaces, where conventional masks or insulating material begins, tends to curve out of flatness because of the tendency of chrome to build up in these areas where current density is concentrated.

WORK IS NOT ETCHED

A typical plating cycle begins with close inspection of the work for pits, scars, heat-treat scale and other surface defects. As in conventional processes, it is essential that the base metal be clean and free of surface irregularities. The better the finish before plating, the better the results afterward. Dimensions are checked for actual sizes before plating, and simple calculations are made to determine plating time and operating current. Plating time merely involves dividing the thickness of the plate desired by the deposition rate. For example, a desired thickness of 0.001 divided by 0.00001 in. per min gives 100 min of plating time. Operating current is based on total area to be plated multiplied by current density.

In cleaning the work, a hot alkaline soap solution and reverse current is employed, together with brush scrubbing in the same solution. This removes

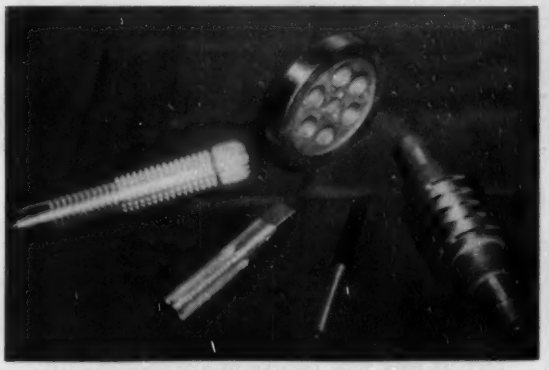
the last vestiges of dirt from pores in the work and produces an exceptionally clean surface for good adherence of the deposit. This step varies from conventional hard chrome plating practice where a reversed current during the actual plating process etches the surface of the work slightly for adherence of the plate. Occasionally, when parts are extremely dirty, rotating fibre brushes are used with a very fine abrasive compound to remove the dirt and oxidation prior to the alkaline cleaning cycle. Of course, in the case of tools such as gages, or where there is no heavy dirt and where surface finishes would be damaged by an abrasive, this step is omitted. A water rinse follows, after which the work is dipped in a mild acid solution, then rinsed again. The actual plating cycle consists of suspending the work in the tank from the cathode rod, adjusting the current to the value previously determined, and setting the time clock. At the conclusion of the plating cycle a visual and audible signal is given, and the work is removed and rinsed. The parts are allowed to reach room temperature before conventional inspections for dimensions and tolerances are made. If it is required to eliminate hydrogen embrittlement, a heat treat at 350 to 400 F is applied for 3 hr or more, the length of time and temperature varying with the specifications for the part.

WHEN TO BLAST

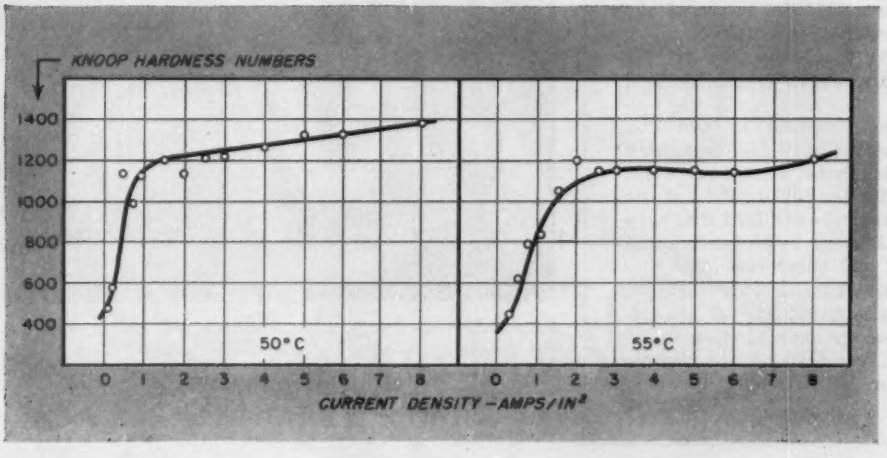
Although wet blasting before plating is not necessarily employed with this process, it is recommended in such applications as piston ring and cylinder plating, where the resulting surface finish provides a means of oil retention. It is also useful for removing such oxide coatings as blued surfaces which cannot be cleaned by other means, and it is especially valuable in plating aluminum from which natural oxide films must be removed.

With standardized procedures set up for each part, and with equipment specially designed for the process, skilled platers are not needed to obtain good results. The procedure can be applied on almost any part or tool with a minimum of instruction and with normal care.

THOROUGH RINSE after plating removes traces of chromic acid. Bore of this part was plated in a tank with anode designed for I D work. Other tanks in special plating unit have O D anodes so both types of work are set up quickly and easily



TYPICAL PARTS plated to precision tolerances include a spline push broach held within 0.0001 in. tolerance, a 1¾-5 HSS tap with 0.0004 in. deposit on PD, and a 5-in.-10 internal thread gage with 0.0007 in. of chrome on the PD. When gage wears 0.0003 in. it is stripped and replated. Triple-lead Acme gage is also plated within 0.0001 in. over wires



IMPORTANCE OF CURRENT DENSITY and solution temperature to hardness of chrome plate is evident by wide range of values obtained by making small changes. Although 2.0 amp per sq in. and 52 C are used here for optimum conditions, hardness of deposit can be changed in range of 600 to 1400 Bhn by varying these factors

THIS PLANT, on the outskirts of Mexico City makes advanced-design steel and wood office furniture, other steel products, sells Fiat automobiles, and adds bodies to two sizes of motor-chassis combinations imported from Italy. The 25-year-old company has this new plant, very modern, in which floors are washed daily —the cleanest I have ever seen. There are 1200 employees, mostly men; women handle only office work and upholstering. Employees are unionized

WORKERS, few of whom have cars, are taken to and from the plant by company-owned bus from designated points. The company also furnishes free lunch in a cafeteria setup from which men go to this attractive dining room with white tablecloths, covered chairs, and fresh napkins. First aid and temporary hospital facilities are provided at the plant, of course. Labor turnover is about 3% per month

Modern metalworking in Mexico

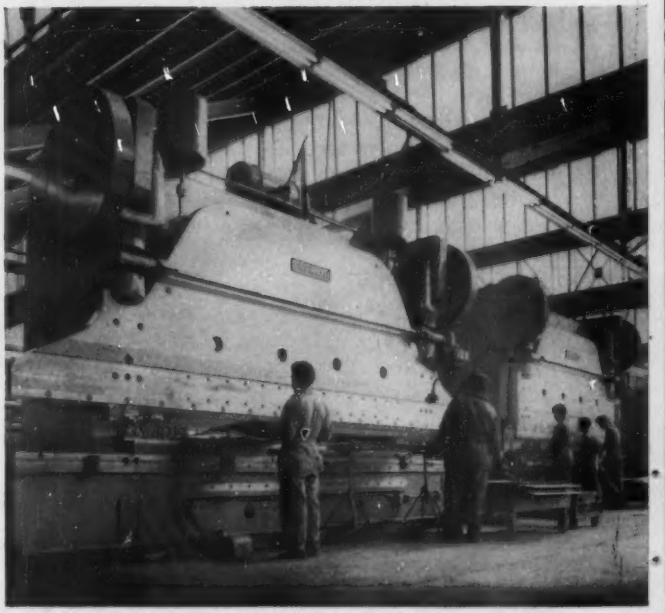
FRED H COLVIN, editor emeritus

The Philosophy Behind the Policies

"Our country, Mexico, in spite of its ancient history, is only now coming of age economically. It is not strange, therefore, that the new generation of Mexicans is intent on finding the best ways of living with each other and working together. In other words, we want to find and use the means best calculated to aid our social and economic development and build up the future of our republic.

"And I firmly believe that the future of our republic and the future of other nations coincide, that the future will be freedom or slavery for all men, depending on what our generation does or fails to do.

"Employer-employee relations in our two countries differ, naturally, but I feel that there is a basic, universal idea that is behind our work, that has been a reality for seven years at the Industrial Cit DM Nacional—the idea that man is the most important factor in production and the greatest asset of any enterprise. The machines and other accountable assets are auxiliary means which the industrialist has at his disposal."—*From an address to the 29th Annual Convention, Natl Assn of Foremen (US) by Antonio Ruiz Galindo, president, DM Nacional.*



EQUIPMENT, largely US in origin, is modern and well maintained. This heavy-press department is typical. Note modern lighting, order and cleanliness, as well as extensive use of up-to-date materials handling for a job-lot plant. Floors here are also washed daily, light fixtures and windows in the monitor roof are kept clean and in repair

SPANISH AND ENGLISH BOOKS, magazines, and papers are catalogued in the extensive shop library, available to all workers. McGraw-Hill technical magazines are, for example, bound here for reference. Spotlessness is evident again, and is not something done just for a picture. Also company officials are particularly careful to avoid any suggestion of paternalism that has caused difficulties north of the border

A LARGE GYMNASIUM, swimming pool, and a six-grade school for children of employees (attendance optional) are among other provisions. Children are brought from their homes by the company buses, provided with free lunches, and taught by state-certified teachers, so local schools have little attraction. A 25-family apartment house to improve worker housing is one recent experiment, and individual homes are now being considered, based on US experience

Ciudad Industrial (Industrial City) DM Nacional is a very modern plant just outside Mexico City, operated by a father, his two sons, and efficient assistants. Plant, facilities, methods, and personnel practices are exceptionally good, as these pictures show

THE TOOLROOM and maintenance shop again shows much American equipment and is kept in apple-pie order. This plant was one shown to visitors during the recent ASME convention in Mexico City which I attended. Latest safety methods are followed, and management methods are equivalent to the best US practice — a significant advance since my last visit to Mexican plants

STAINLESS-STEEL FENDER MOLDING is formed in die with Ampco bronze liner and pressure pad. Secondary polishing operations usually required to remove scratches and die marks are considerably reduced by use of hard bronze inserts

Hard bronze draws stainless

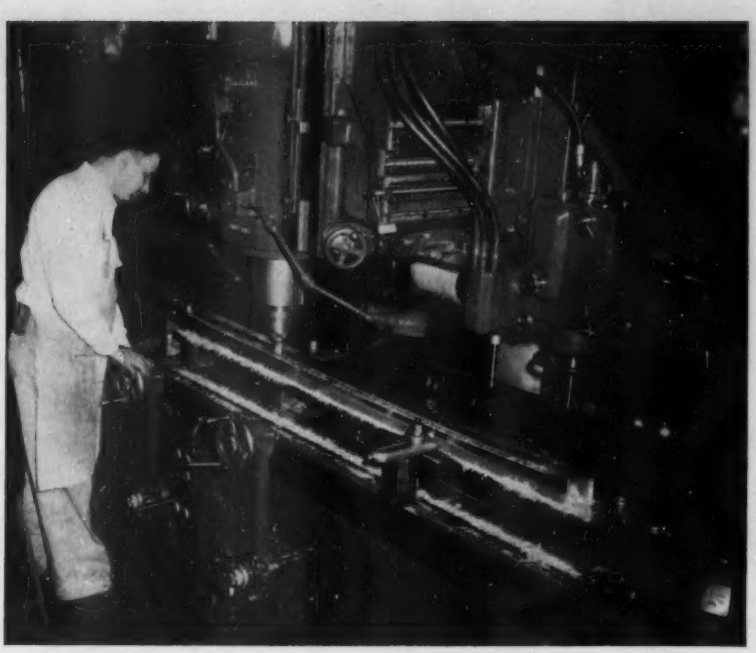
Bronze wear inserts for drawing and forming dies are not new, but a recently developed alloy has a life averaging two to five times that of conventional die bronze and produces better results. Its performance in drawing and forming stainless is described here together with some of the special problems encountered in its use

Eliminating galling, scratching, and buckling is important in drawing and forming operations because appearance counts heavily in the manufacture of many products, especially those used in the automotive industry. Stainless steel has always been a difficult material to form because of its tendency to seize, or pick up, hardened die steel no matter how well polished and smooth the die surface might be. Bronze wear strips provide an answer to this problem when they are assembled in drawing and forming dies in those areas where the drawn material is moved considerably. Sliding contact of the sheet on the wear insert results in little or no scratching and galling because the dissimilar bronze alloy is essentially an anti-friction material. Two bronze alloys (Ampco Metal, Inc, grades 21 and 22) have been used for some time for such applications as well as for roll forming, bending and tube reducing.

A third alloy (Ampco 24) more recently developed is a harder, more wear-resistant material. Although is somewhat more expensive than die steel, net cost is about the same because it is cast to shape and no heat treating is required. Having a lower coefficient of friction than the other two, it is used exclusively in this plant for inserts in drawing and forming dies employed for making stainless steel automobile reveals. Results in production have been excellent; for example, in one complicated drawing operation only 100 stainless pieces were produced in a hardened, ground, and polished steel die before galling became so bad that the die had to be refinished. Ampco 24 bronze inserts were installed and permitted an uninterrupted run of 50,000 pieces. In another, less-extreme, case, 30,000 stainless parts were formed in a steel die after which redressing was necessary, while 93,000 similar pieces were formed over the hard bronze material before redressing.

MACHINING PROBLEM

Usually, surface finish improves in use because density at the surface increases with work. Grain structure of this close-grained cast material is one of minute, intensely hard particles evenly distributed



FINISH CONTOUR MACHINING hard bronze insert for rear fender molding die forming is done with 4-lip carbide-tipped end mill. Cutting speed is 900 sfpm with feed of 0.002 ipr

without scratches

ARNOLD WALZ, general manager
FAIGLE TOOL & DIE CO DEARBORN, MICH

throughout a matrix. Although this structure provides good wear resistance, it also imposes a machining problem because the material is hard, extremely dense, and brittle.

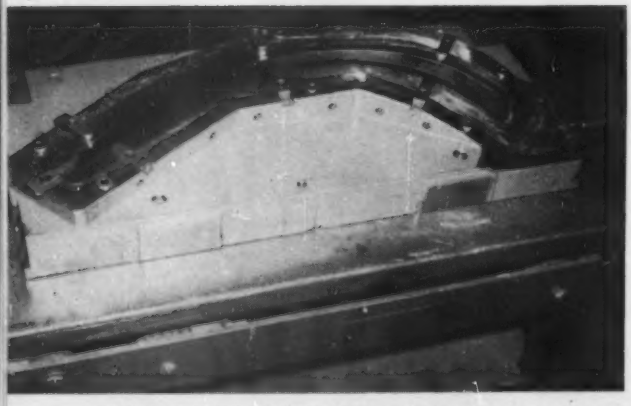
FINE FEEDS AND NEGATIVE RAKE

Experience in this plant indicates that castings are best cut with rubber wheels because of their abrasive action on saws. In machining Ampco 24, heat must be avoided to prevent cracking and breaking. To accomplish this, light feeds are used in all operations and carbide tools with negative rake are employed wherever practical. HSS end mills with negative rake also give good results in contour machining. Straight-fluted, 4-lip carbide-insert cutters are also being used successfully for duplicating, contour and plain milling.

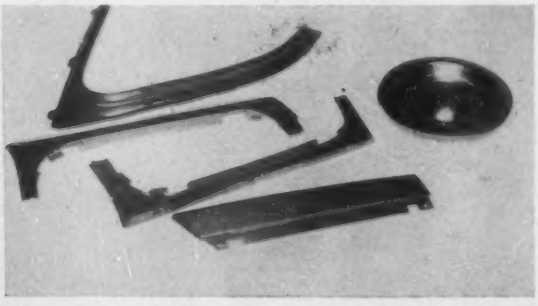
Drilling requires relatively slow speeds because hardness and density of the material tend to dull tools quickly and seize the cutting edges. A method of eliminating seizing of this material is to grind the drill with an 0.005-in.-offset point. This causes

HAND GRINDING a hard-bronze wear insert follows contour machining to insure accurate fit. Inserts are also polished to high finishes with oil stones and oil lubricated silicon-carbide abrasive cloth

FINAL CLEARANCES and fits are made by grinding inserts in tryout presses. Clearances are same as those employed in steel drawing and forming dies



TYPICAL CI DRAW DIE RING lined with hard-bronze inserts. This tool draws 0.025-in.-thick 430 stainless to produce rear fender quarter moldings



STAINLESS AUTOMOTIVE REVEALS drawn in Ampco 24 dies include hub cap, front and rear window moldings. Material was 0.025-in.-thick 430 stainless, made in high-volume production

the drill to produce a hole 0.010 greater in diameter than the drill size, thereby providing greater clearance at the cutting edges. Carbide-tipped drills are used nearly exclusively here because of the extreme abrasiveness of this material. General practice for drilling is to use light feeds with soluble oil or any good grade of sulfur-free coolant. Typical of the drilling feeds and speeds employed is about 800 rpm for a 5/16-in. drill at 0.004 ipr.

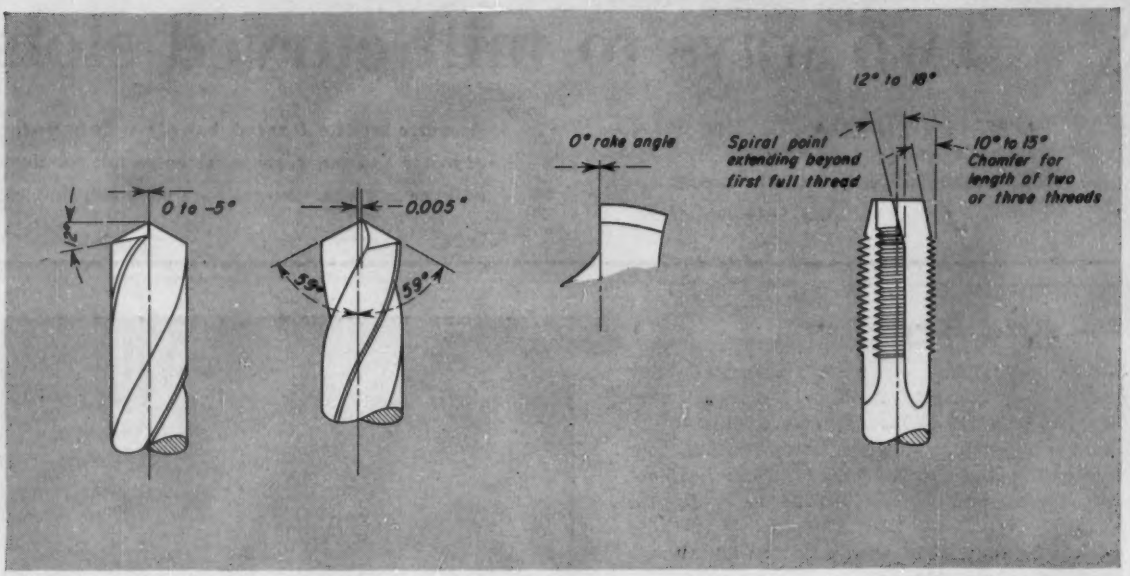
Factors that enter into determining speeds and feeds for drilling are the depth of hole, wall thickness, rigidity of the machine and work, and of course, the drill size. Particular care must be exercised to avoid a sudden break-through, particularly because this metal has a tendency to chip around the edges.

TAPPING POINTERS

Tap breakage can be excessive unless considerable care is exercized because the material tends to grip delicate cutting edges. Zero or a negative rake angle and a chamfer of 10 to 15° for a length of two or three threads provides strength. In addition, a 12 to 18° spiral point, extending beyond the first full thread, is helpful. Hand tapping with plain soda water as a lubricant produces good results.

FINE FEEDS FOR TURNING

In turning, carbide tools and very fine feeds are important; 0.002 to 0.005 ipr being considered good practice for finish turning with speeds of 700 to 1,000 sfm. For roughing, feeds may range from 0.007 to 0.020, and speeds can be around 300 sfm. Tools should be rigidly supported and should always be on, or 1/64 in. below, the center — never above. Here again, negative back rake or no side rake produces



STANDARD DRILLS AND TAPS are reworked for machining Ampco 24 because of its high density and hardness. Negative rakes and fine feeds give best results

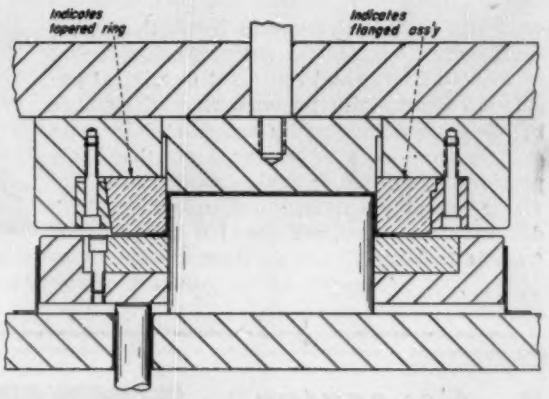
best results. Usually a 15° negative side rake is used for rough machining, zero for finishing.

Grinding is considerably simpler than machining because the hardness and density of the material suits this work particularly well. Coarse, open-grained, silicon-carbide vitrified wheels are used here extensively with fine feeds. Wheel speeds from 5,000 to 6,000 sfpm give good results with work speeds ranging from 25 to 150 rpm, depending upon the size. Hand grinding is preferred to other means of finishing contours after machining and for making necessary adjustments to inserts in tryout presses. In all cases, care is taken to avoid breaking thin sections of this brittle material. Stoning and hand polishing are also employed to obtain high finishes. Usually 8 micro-inch finishes and less are achieved with oilstones and oil-lubricated silicon-carbide abrasive cloth.

WEAR INSERTS EASILY INSTALLED

Various means are employed to assemble bronze wear inserts, tapered holding rings and gib clamping devices being the best. Where shapes do not lend themselves to this type of installation, inserts are drilled and tapped for assembly with screws. In all instances, they must be well seated and supported by steel or CI holders. There should be no overhanging sections because the material has very low elongation.

Usually inserts are made sufficiently large to permit all the metal being formed to be drawn over bronze surface. This insures complete freedom from galling or scratching. Pressure pads made of this material eliminate scoring on the inside of the part being drawn and also equalize the coefficient of friction above and below the blank. Hold-down pressures are the same or slightly higher than those used with steel pressure pads because of the low coefficient of friction.



INSTALLING INSERTS in dies can be done by screws and dowels, tapered holding rings and flanged assemblies. Seating must be accurate and inserts should be well supported

PARTICLES IMBED

Although Ampco 24 has high compressive strength and can withstand great pressures, in this plant it is not used for applications where high impact is encountered. General practice is to avoid its use in places where there is no movement of metal over its surface because particles of dirt and other foreign matter tend to become imbedded in it. The sliding action of drawn metal prevents the sticking of such particles, whereas on other surfaces they adhere and scratch work with which they come into contact.

Two ways to mill curved slots

HERBERT P KUNKLEMAN
tool engineer, SMALL MOTOR DIV,
WESTINGHOUSE ELECTRIC CORP, LIMA, O

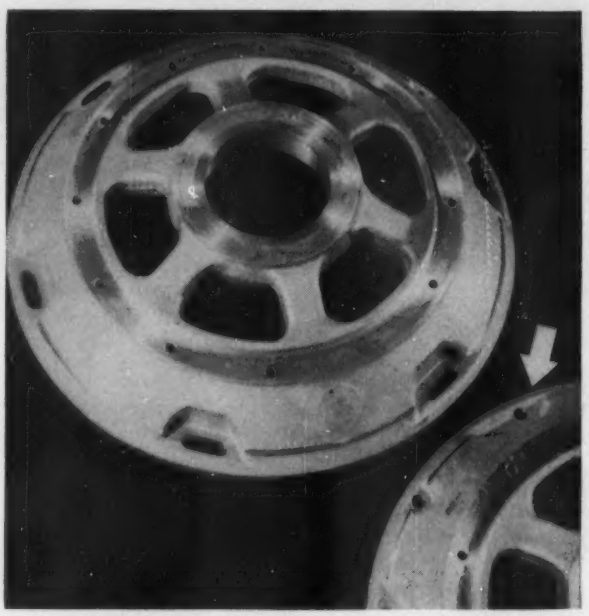
Accurate arcuate (curved, bowed) slots in flanges of motor and generator housings permit rotational adjustments when the units are mounted. One way

1.. End Bracket

Aluminum castings are in two sizes, but both have 5⅛-in. rabbets machined on their outer faces, so they can be loaded in the drillpress fixtures without changing the base. The six slots are equally spaced around the 5.969- or 7.375-in. bolt circles, and are 0.210-0.224 in. wide and about ½ to ⅝ in. long through ½-in.-thick flanges. They must be within 0.5° on length and 0.005 in. on location.

Starting holes of 0.210-in dia are drilled at the first setup, and slots are cut at the second. Automatic cycle controls downfeed of spindle, which moves spring-loaded pressure plate onto work, holding it down on guide pins. Spindles come down, and after cutters break through, a limit switch actuates the Bellows cylinder that rotates the fixture and returns it to original position. To carry side pressure as work rotates, ball-bearing cutter guides are carried in main guide plates. Work locates on a pin that fits a previously drilled hole in the casting.

One operator can load and unload for both drilling and slotting, and time has been reduced from 16 to 2 min.

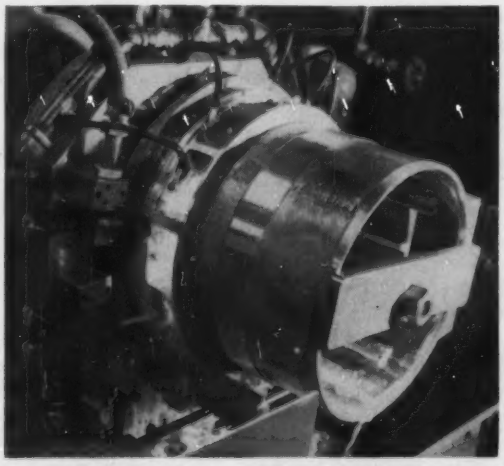


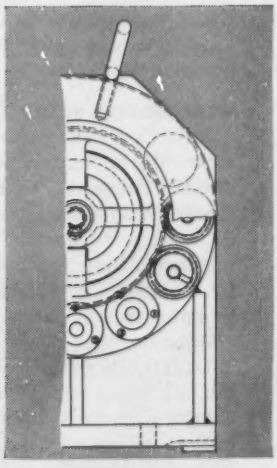
GENERATOR END BRACKET has six curved slots, started from drillled holes (as at lower right of photo), and machined on . . .

2.. Generator Frame

Work is an 8⅛-in.-long, 11-in.-OD casing with end flange. Holes for the 12 slots are drilled separately, then work is brought to welded fixture originally made to set on horizontal-spindle miller. Unit now works on steel base fitted with motor and gear reducer.

Work slips over projecting cutters and is clamped, then spindles start and rotary motion forms slots. Bolt circle is 10 in.; end mills are 0.4 in. in dia and cut through 0.486-in. flange.



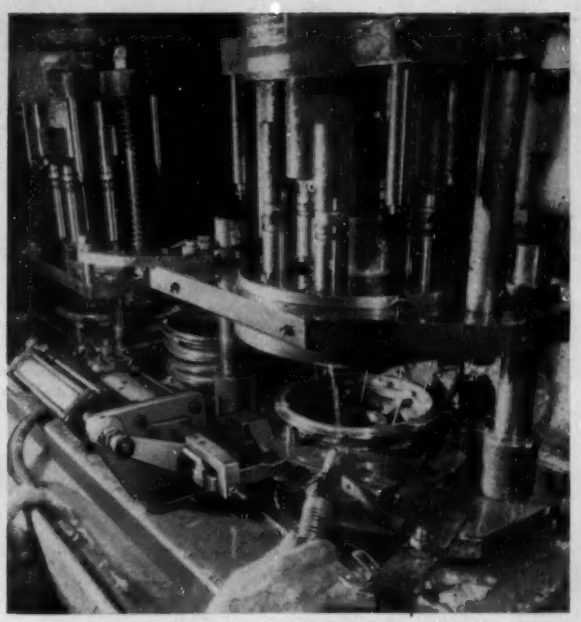


GENERATOR FRAME has 12 curved slots, is clamped on welded fixture where cutter-spindle pinions are driven by central sun gear driven by worm-gear speed reducer

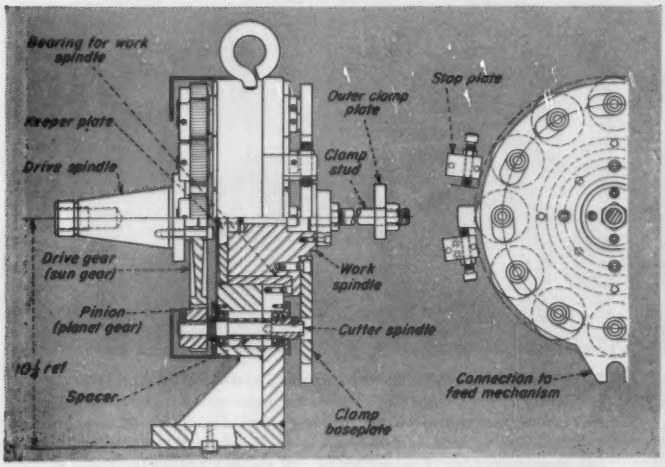
to cut the slots is to mill them, one at a time, on a rotary table under a vertical-miller spindle. But production rate and quality from this method are much too low for present-day demands.

Two different parts—a generator end bracket and an aluminum generator frame—are now slotted by two methods that are much faster, cheaper, and which virtually eliminate rejects.

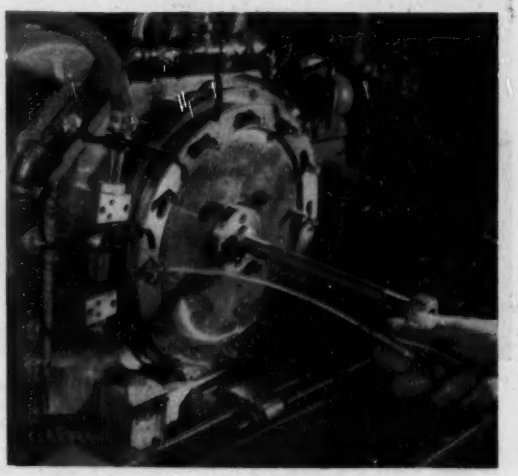
TWO-SPINDLE DRILLPRESS with two six-spindle heads. Holes are drilled at far setup, slots milled out at near setup under automatic control. Slots are generated by motion of . . .



ROTATING FIXTURE BASE that is moved through 6° of arc by limit-switch-controlled air cylinder hooked to linkage

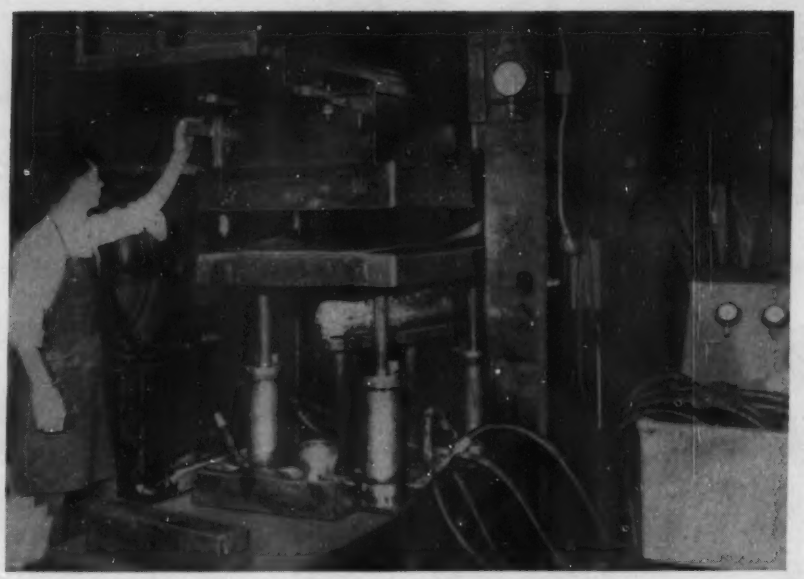


FIXTURE is welded up to allow 7½° of rotation powered by air cylinder. Cutters work through . . .

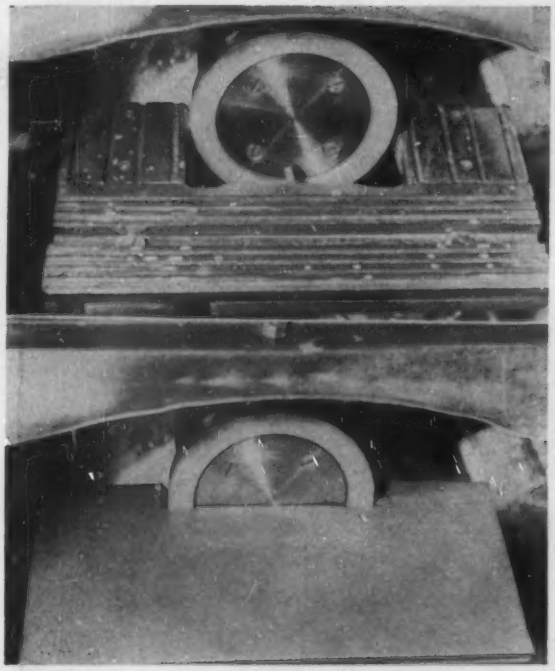


FIXTURE SLOTS in plate against which work is clamped. Coolant manifold helps wash away chips, as does operator-held hose that squirts oil

talented tooling

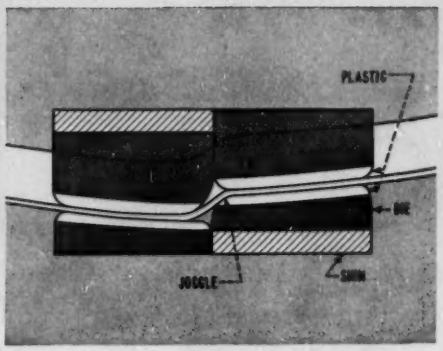


HYDRAULIC FORGING PRESS was converted for deep drawing by changing speed and length of stroke, increasing bed size, utilizing limited side housing clearance, and designing suitable draw dies. Overhanging bolsters 36 in. deep were added to close shut height and increase rigidity; size is 14 ft long to take 0.072-in. aluminum to be drawn into fuel-tank nose sections. Verson press has 8 self-contained cushions powered from portable hydraulic cart. Tonnage rating increased from 250 to 300. *Pastushin Aviation Corp, Los Angeles*

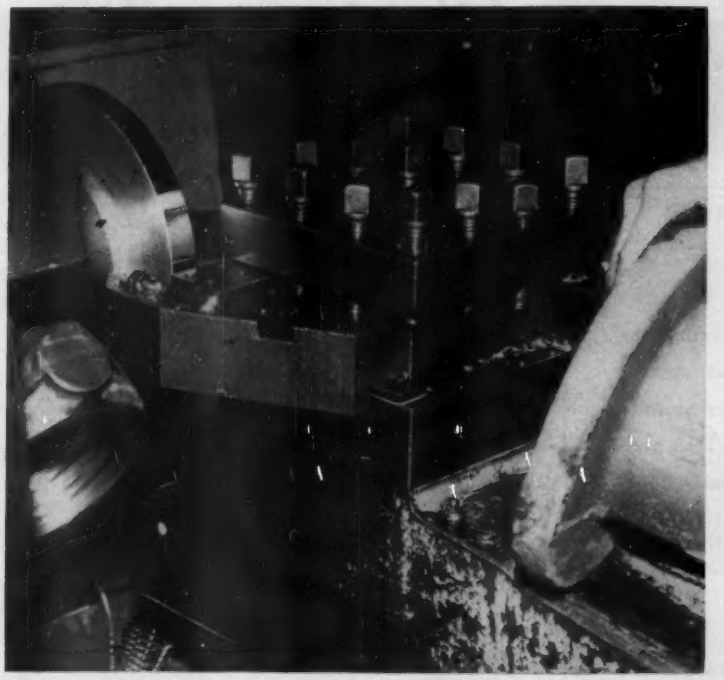


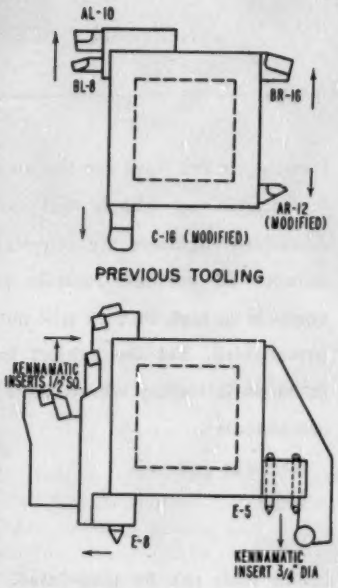
SAFER GRINDING WHEELS are result with two attachments made to tool grinder. Hardened steel plate is bolted into wheel recess, with outer face just 1/32 in. back of wheel edge. Steel secondary table fits on original table rest, covering holes and limiting space between wheel and table edges. *National Supply Co, Torrance, Calif*

AIRLESS ABRASIVE BLASTING cuts finishing costs 25% by replacing sandblasting, done manually. Fixtures for holding small stampings and castings are not required. Parts are tumbled and blasted with G-50 chilled-iron shot in totally enclosed American Wheelabrator unit that keeps plant cleaner. Up to 350 castings can be handled in 15 minutes, which used to take 5-6 hrs of sandblasting time. Method also helps detect bad parts before oxidation or plating. *National Brass Co, Grand Rapids, Mich*



PLASTIC THAT STANDS 36,000 PSI faces joggle dies that work aircraft parts. Tooling time is only 35 hrs in the plastic, "Dunnlew", where 100 hr would be taken for steel. Plastic is poured between rough die halves with unformed work between, then cut in half with die halves. Joggling edges are filed, then dies are shimmed in press, ready to go. Units work in 90-ton Verson press. ***Boeing Airplane Co, Seattle, Wash***





RETOOLED TURRET LATHE cuts ball-bearing swivel joints with less down-time for regrinds. A 3H Warner & Swasey was switched from all-carbide-tipped tools to part-inserted, part-brazed Kennametal carbides in new turret arrangement. Pc per grind increased from 12-20 to 20-400 (allowed by indexing inserts). Lathe turns, step-faces, serrates, backfaces, forms radius, and chamfers at 141 rpm, 0.008 and 0.024 ipr feed, and ⅛ to 5/16 in. depth of cut. ***Chickson Co, Brea, Calif***

STANDARD MARKINGS ON THIS WHEEL show it to be:
A—alumina
24—made up of 24-grit particles (meshes per lineal in.)
P—medium hard on scale from A to Z
4—fairly dense on scale from 1 to 15 or higher
B—and resinoid-bonded
A—Electro Refractories & Abrasives Corp's code designation
The "5" at left and "1" in the middle are manufacturers code designations indicating type of grain and grain combination

Take your pick of a million

NORMAN P ROBIE, asst director of research, ELECTRO REFRACTORIES & ABRASIVES CORP, Buffalo, N Y

Dazzling is the word for the number of different grinding wheels that can be made. Abrasives engineers are convinced that the number of possible ceramic and organic bonds is so high that all will never be fully investigated. Yet the subject isn't as confused as it seems; wheels have only three components . . . .

Abrasive grit

Bond

Pores

and each can be pinpointed. To get the right wheel for the job at hand, you pick the best three components, then put them together. Here's how it works. . . . . .

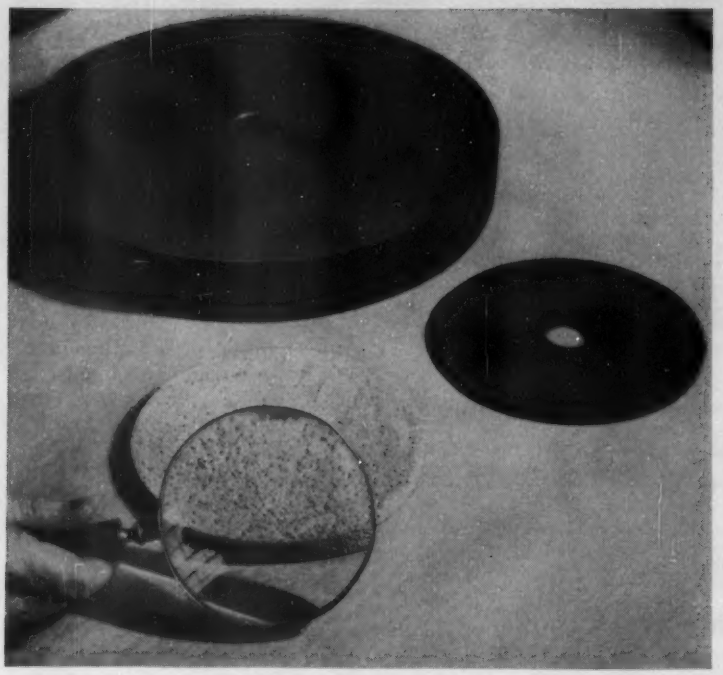
Grinding abrasives must be hard, with controlled physical properties. Some natural abrasives such as garnet, emery, corundum, and diamond are used in wheels to some extent, but the most widely used abrasives are two synthetic products—fused alumina and silicon carbide.

Because they are manufactured, they can be varied in their physical properties somewhat to suit the conditions of grinding. Fused alumina is more versatile in this respect, because it is more readily affected by chemical composition and treatment than silicon carbide. Crystal sizes are controlled partly by cooling rate and crystallization conditions, and toughness is influenced by impurities and grit shape, which is controlled by milling or after-treatment.

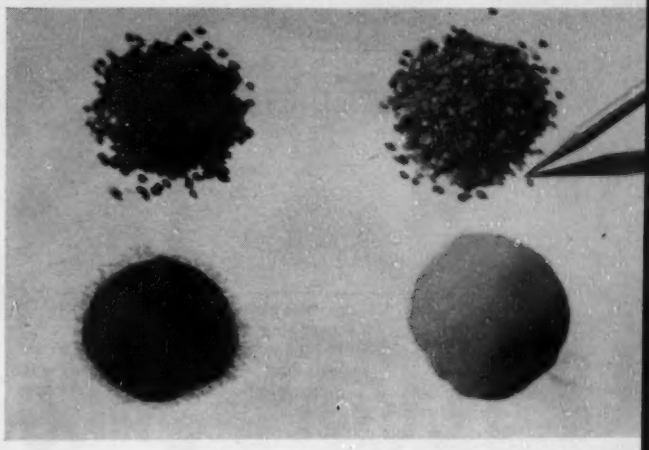
Alumina is the tougher material, and works best on high-tensile semi-steel. Silicon carbide, being harder but more friable (easily crumbled), is better for very hard or low-tensile materials.

Wheel action depends partly on grit size, and coarse grit is best for fast grinding, soft materials; fine grit for hard, brittle materials and for fine finishes.

Another effect of grit size is found when grit sizes are mixed. Though average grit size in a 12-grit wheel would be 12, a mixture tends to make the



POROUS VITRIFIED WHEEL for cutting hardened steel is made by including combustible materials that burn out during firing, leaving open, cool-cutting structure



GRAIN SIZE CAN VARY through these extremes (silicon carbide left, fused alumina right), though most use is made of sizes in coarse and middle ranges

grinding wheels

table I...RELATIVE HARDNESS OF MATERIALS

MATERIAL	MOH'S HARDNESS	KNOOP HARDNESS
Talc	1	0
Gypsum	2	32
Calcite	3	135
Fluorspar	4	163
Apatite	5	395
Glass (depending on composition)	—	300 to 500
Feldspar	6	560
Hard Steel R_c60.5	—	740
Quartz	7	800
Topaz	8	1250
Cemented Carbides	—	1400 to 1800
Corundum	9	1635
Tungsten Carbide	9+	1880
Fused Alumina	9+	2000
Tantalum Carbide	9+	2200
Titanium Carbide	9+	2460
Silicon Carbide	9+	2500
Boron Carbide	9+	2800
Diamond	10	Greater than 7000

Data from "Tooling & Production," Feb, 1953—Page 32
"Grits and Grinds," Vol 41, No. 3—Page 11

HARDNESS SCALE shows synthetic abrasives well up on the list. Moh's number is only a rough indicator; Knoop's relative hardness

wheel denser, stronger, and to affect the finish produced.

BONDING AGENTS

Organic bonds include synthetic resins, rubber, and shellac; molded and hardened at relatively low temperatures. These have toughness and elasticity, and therefore provide wheel safety at high speeds and allow thin wheels to be made. Reinforcements like rings, bushings, wire screen, and fabric can be molded into organic-bonded wheels, and the wheels take rough usage as on floor-stand, swing-frame, and portable snagging grinders. Another point is that organic-bonded wheels can be made rapidly, not requiring the long drying and firing cycles that are necessary for ceramic-bonded wheels.

table II...TYPES OF ABRASIVES

1. Very tough fused alumina	High TiO_2 & impurities. Heat treated. Highly mulled. May have small crystals.
2. Regular tough fused alumina	High TiO_2 & impurities. With or without heat treatment and mulling.
3. Friable fused alumina	Low TiO_2 & impurities.
4. Spl. friable fused alumina	Lower in impurities. One variety large crystals crystallized in molten FeS_2.
5. White fused alumina	Purest in Al_2O_3. Most porous due to vapors from solium content.
6. Tough silicon carbide	Black blocky crystals highly mulled to break down weak grits.
7. Silicon carbide	Black & green varieties, the green variety being the purest chemically.

TOUGHNESS RANGES from fused alumina (high) down to silicon carbide (low); is influenced by grit shape, heat, and chemical impurities

table III...SELECTION OF ABRASIVE

ALUMINA For high-tensile materials 50,000 psi & over			SILICON CARBIDE For low-tensile materials under 50,000 psi
Tough alumina High titania	Friable alumina Low titania	White & special Friable alumina	Black & green
Soft steels	Mild steel	High-speed steels	Cast iron
Alloy steels	Some hardened steels	Hardened steel	Chilled iron
Stainless steels	Tough bronzes ... & alum. alloys	Carbon & alloy steels	Brass & soft bronzes Aluminum & copper
Wrought iron			Various stones
Annealed Malleable iron ...			Cemented carbides Non-metallics Rubber, plastics, etc
For rough heavy snagging General-purpose grinding Heavy-duty precision grinding Cutting-off wheels	For fast cutting snagging Precision & tool grinding Cutting-off wheels	For fast cool cutting Fine precision toolroom work Internal grinding	For snagging, cutting-off, and toolroom wheels

SELECT ABRASIVE for ordinary work according to this chart, then vary bond, grit, and pore volumes, wheel density, grit size to increase effectiveness

table IV...GRIT SIZES AVAILABLE

COARSE	MEDIUM	FINE	VERY FINE	CLASSIFIED FLOUR SIZES	UNCLASSIFIED FLOUR SIZES
				280	
8	30	70	150	320	F
10	36	80	180	400	2F
12	46	90	220	500	3F
14	54	100	240	600	4F
16	60	120		1000	XF
20					
24					

SIZES ARE ROUGHLY MESHES per lineal in., or screen grading through which particles sift

Ceramic bonds (also called vitrified) are brittle, hard, and cut cool. Combustible particles like walnut shells are sometimes included so they will burn out during firing to leave open spaces that promote cool cutting. Ceramic bonds are more stable chemically, and can be varied in properties so vitrified wheels can be made over a wide range of grades.

Vitrified bonds are therefore used where precision and cool cutting are required; organic bonds for rough work and cutoff; also for wheels where the two common abrasives must be mixed.

PORES AND STRUCTURE

Spaces between grit particles and bonding material are called "Pores," and are most often filled with gases, but sometimes contain wax, shellac, varnish, grease, or other substances that tend to reduce wheel loading and glazing and promote cool cutting action. High pore volume, by itself, makes a soft, fast-cutting wheel, while low pore volume makes a hard, longer-lasting wheel.

Wheel structure varies considerably, as the percentage of volume in a wheel filled by abrasive grit has been known to run from 36 to 60%, bond from 2 to 50%, and pores from to 2 to 60%. Generally, a new grinding application calls first for a wheel of something near average proportions, from which base the percentages can be changed if needed.

Wide grit spacing—a more open structure—is applied for cool cutting; attained by using more bond and less grit or with larger pore volume. High bond percentages make durable wheels, but cutting may be affected.

Faster cutting is aided by increasing the amount of pore space, which gives better chip clearance but which allows faster wheel breakdown. Thus, wheel specification boils down to this idea: Gain in one direction by giving up some other advantage, and pick the least essential advantage as the one lost.

As the tables indicate, general rules for picking wheel compositions are fairly straightforward. Best practice is to try the best wheel you can pick, then change it if it doesn't work.

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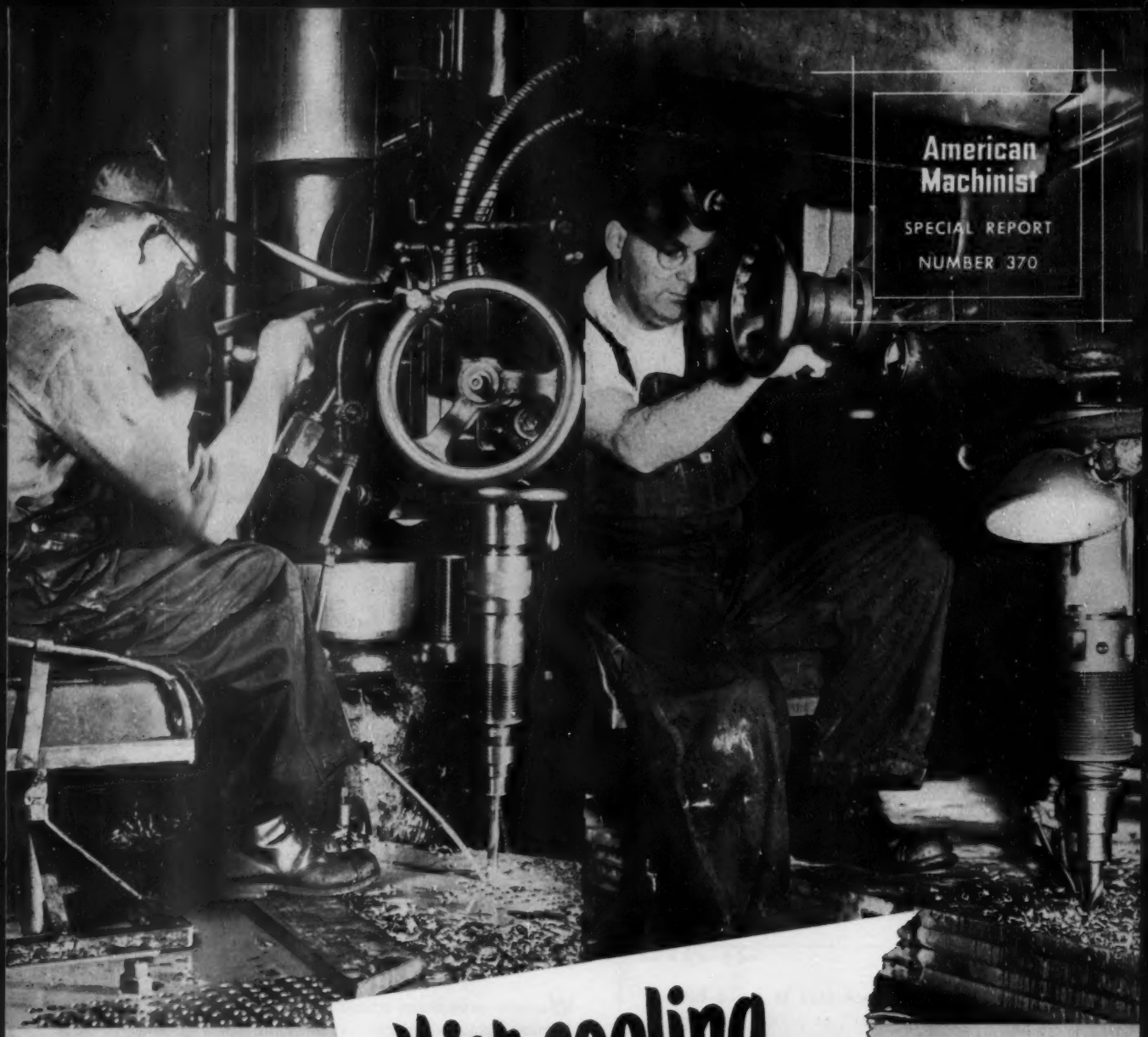
NUMBER 370



BEFORE:

Mist cooling goes to work...

AFTER:

Interest in mist cooling has grown steadily since publication of the first Special Report (*AM* — Sept 14, '53, p137) on the process. To bring you up to date on this technique, two plants report on ingenious applications

part I: Mist-cooling systems improve machining operations

RICHARD P THUMA, superintendent
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Tools & Maintenance Department
GENERAL MACHINERY DIV, ALLIS-CHALMERS MFG CO

part II: Mist cooling helps some planer jobs

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R M TITUS, industrial engineer
W C THUERWACHTER, tool supervisor
GIDDINGS & LEWIS MACHINE TOOL CO

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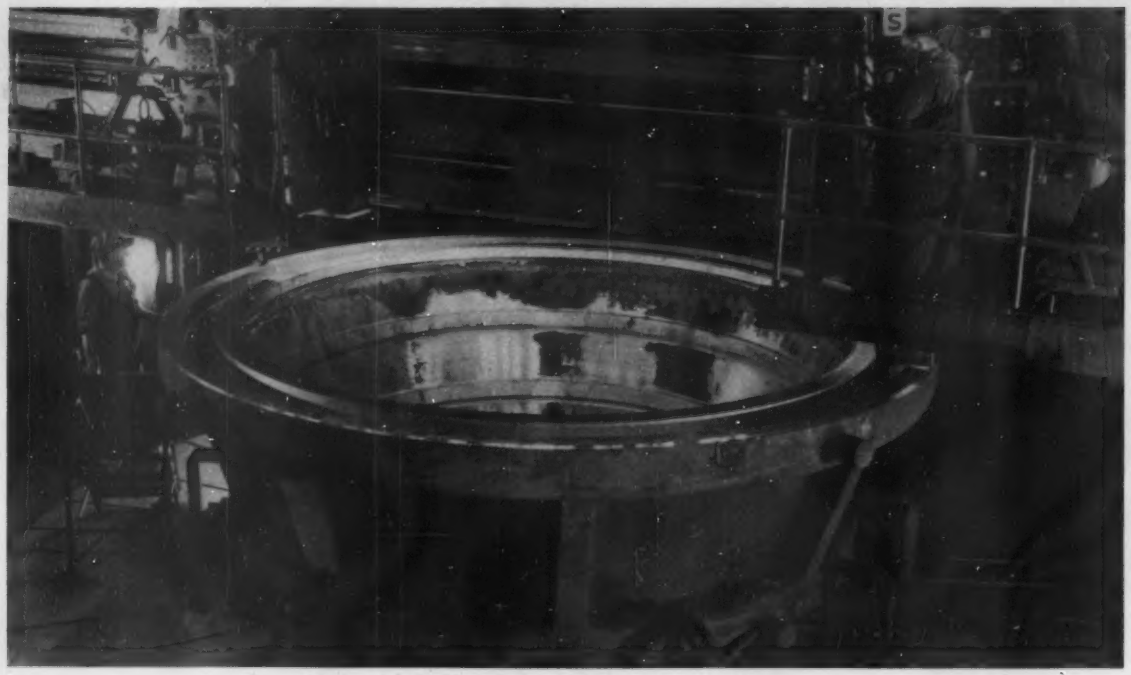
part I . . .



The largest machine: 30-ft

LARGEST MACHINE in West Allis Works to which mist cooling has been adapted is this 30-ft boring mill. Separate injector systems supply mist coolant to each head through approx 65 ft of ¼-in.-ID copper tubing and synthetic rubber hose. Toolholders are drilled so spray nozzles can be mounted on either or both sides

It might be a good idea to say a little about the term "mist", as we use the word in this report. The "mist" in mist cooling is a rapidly moving mixture of air and coolant, which has been mixed up in either a venturi-mixer, or some kind of mixing valve, such as a simple T-connection into which air and coolant are forced under pressure.

The "wetness" of the mixture may vary considerably, depending on the needs of the job, ranging from a very light fog, in which the liquid can scarcely be seen, to a dense spray, such as seen in some of the planer jobs in the second half of this report.

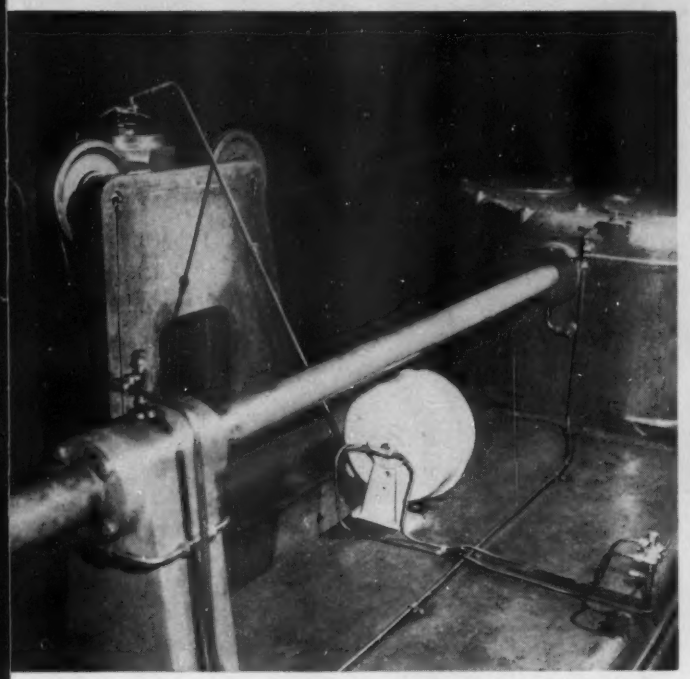
Operating pressures also vary, from about 5 psi to 50 or 60 psi. This, of course, changes the velocity at which the air-coolant mixture comes out of the discharge nozzle.

Mist-cooling systems

We now have more than 200 successful applications of mist-cooling systems on machine tools at Allis-Chalmers' West Allis Works, and a good many more are being tested. Machines now using mist cooling on normal production operations range from engine and turret lathes, knee- and bed-type milling machines, radial drillpresses, and small planers, to huge planer-type milling machines and boring mills. Largest machines now using mist systems include a 78-in. vertical slotter, a gear shaper that will cut spur gears up to 20-ft OD, a 9 x 9 x 30 ft planer-type mill, a 72-in. engine lathe that will machine parts up to 30 ft long between centers, and a 30-ft boring mill.

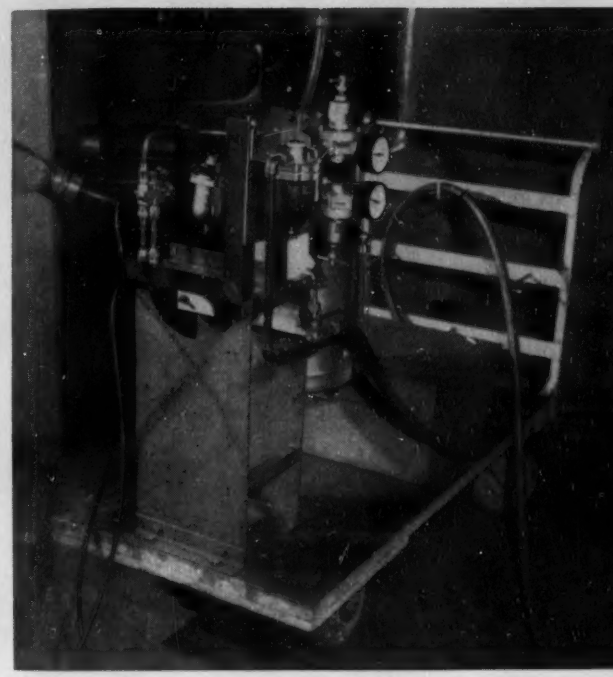
Advantages of mist cooling include improved working conditions, with less splashing, and no splash guards to bother with; easier maintenance (no sumps to fill or clean); safety—cleaner floors; and improved tool life.

Also, layout lines and centerpunch marks are not covered with cutting fluid. Instead, the airstream carrying vaporized cutting fluid helps keep chips away from cutting areas, and makes it



boring mill...

AIR-COOLANT mixture is delivered to centrifugal distributor (lower right) at top of 30-ft mill, 26 ft above floor. It then goes to 25-ft hose reel and into tube down bore of ram for connection to drilled toolholder. Injector operates at 40 to 60 psi



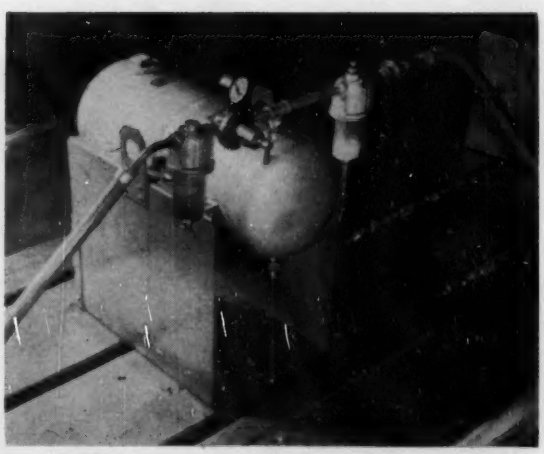
VAPORIZER developed to try out spray system throughout shop is this truck-mounted 3 gal-capacity unit. Mixing valve, instead of venturi vaporizers, supplies two spray nozzles at the ends of 12-ft-long, 3/16-in.-ID synthetic rubber hose lines

improve machining operations

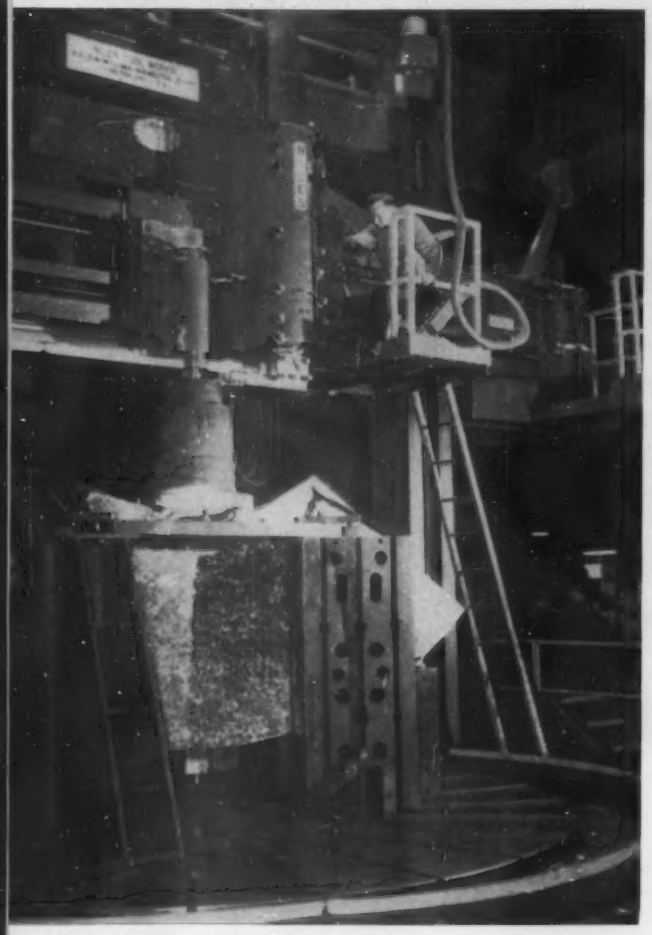
easier for an operator to follow machining layouts.

Some of our mist-system installations are similar to those of other metalworking plants and previously described (*AM*—Sept 14, '53, p 137). Several available types of injectors are used. Installations are both permanent, at individual machine tools; and portable, on stands that permit moving the units about the shop for on-the-job tests.

Also, some success has been achieved by vaporizing the cutting fluid into the airstream by passing the two streams through a Tee fitting or mixing valve, instead of through a venturi vaporizer. This procedure has the advantage of using the conventional flood coolant system on the machine to deliver cutting fluid to the mixing head. Thus, only an air line, control valves, and adjustable-discharge spray nozzles need be added to provide mist cooling on many machines. Also, with this kind of installation, three methods for cooling work and tools can be obtained by simply adjusting the air and fluid supply valves: 1. With fluid valve open and air valve closed, conventional flood cooling results.

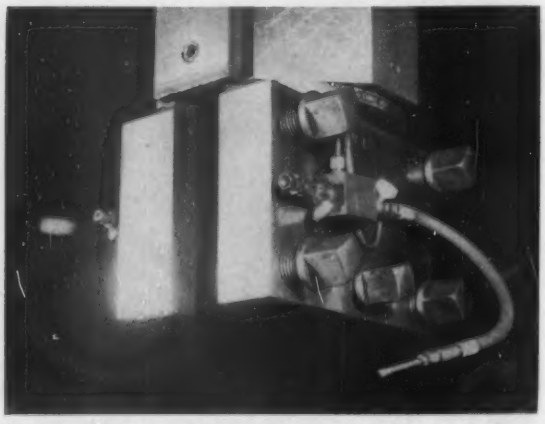


SHEET STEEL FRAME holding this 6-gal capacity injector unit can be moved with crane or hoist. Unit was developed for departments where some machines use mist cooling only for some jobs, and flood coolant systems for other jobs

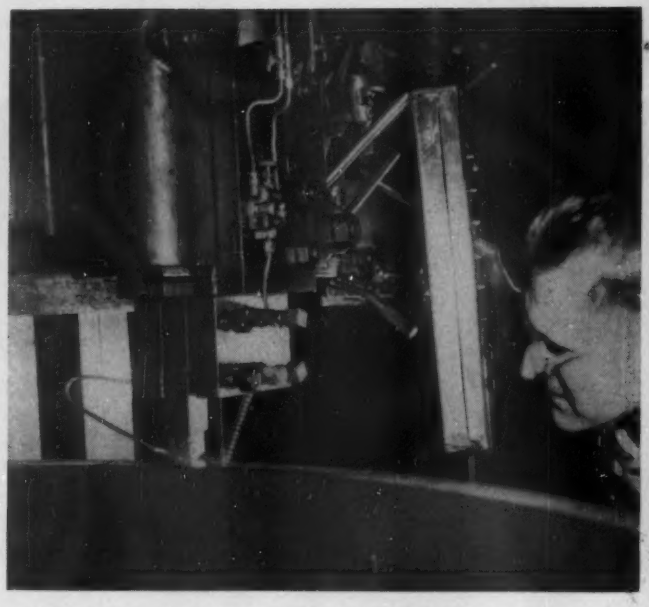


16-ft boring mill...

TWO 6-GAL INJECTORS supply mist coolant to two rams of this 16-ft boring mill through separate systems, each of which includes a centrifugal distributor and 40-ft of ¼-in.-ID copper tubing and synthetic rubber hose. Operator prefers to use 60-psi pressure



UP TO THREE NOZZLES (flexible tubes or ⅛-in.-ID metal tubes) can be connected to each side of tool holder on end of ram on 16-ft boring mill. Tools remain cool, even when cut is heavy



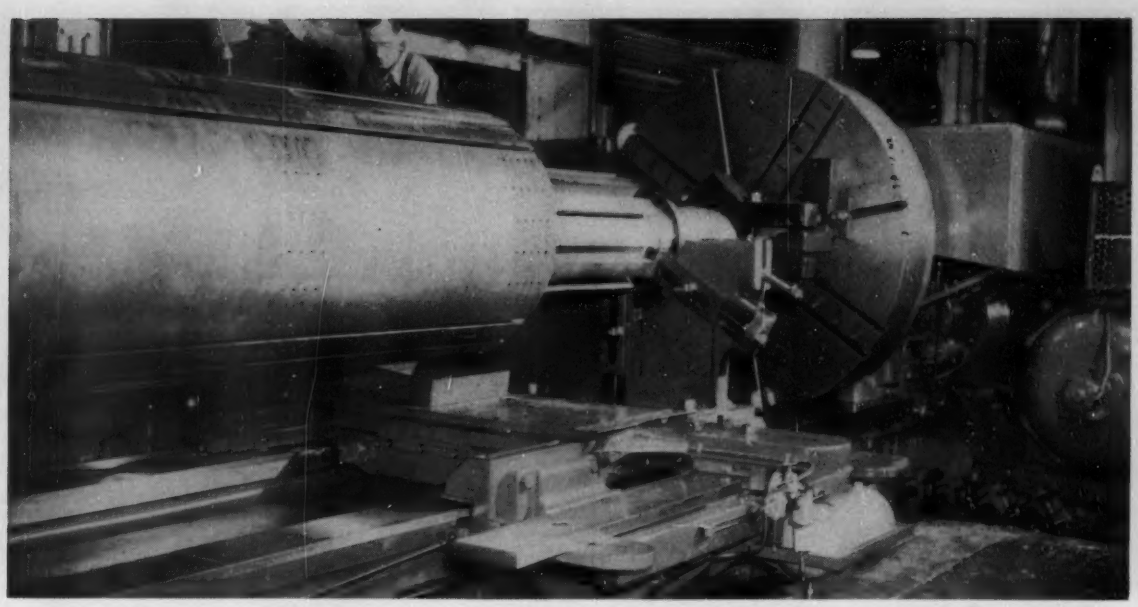
SEPARATE HOSE and tube lines bring air and fluid to mixing valves on each head of this 6-ft boring mill, set up to face rim of 72-in.-OD, 16-in. face-welded steel rotor spider. Pressure in fluid supply tank is approx 5 psi greater than air supplied to vaporizing chamber of mixing valves, to prevent blowback

2. Both valves open give vaporized cutting fluid. By adjusting the two valves, fluid-to-air ratio of the coolant is changed to suit job conditions.
3. With only the air valve open, jets of compressed air can be directed through the nozzles to cool work and tool when material cannot be machined with fluid.

TURNING, BORING, AND MILLING

Original installation of mist cooling at the West Allis Works was made a little more than a year ago on a 64-in. side-head boring mill machining hard nickel-manganese steel forgings. Mist cooling is still on the job and has given a 50% increase in carbide-tipped tool life, with increased speed and feed, compared to previous dry cutting. Vaporized coolant is fed from the 6-gal injector (mounted on brackets at the rear of the machine), to a centrifugal distributor on top of the machine, thence to the top of the ram, and down to a valve and nozzle support block on the face of each toolholder. Only disadvantage is that it takes about 5 to 7 minutes for an adjustment in coolant-to-air mixture to traverse the 20 ft of tubing between injector and nozzle, even with pressure regulator set at 50 psi.

In another important job involving hard-to-machine material, mist cooling has given a considerable increase in tool life. Carbide-tipped tools turn a 6-in. length of hard-facing material welded circumferentially around a 3½-in.-dia steel shaft. About ¼ in. of material must be removed from the diameter of this section.



72-in. lathe, with spray shoes...

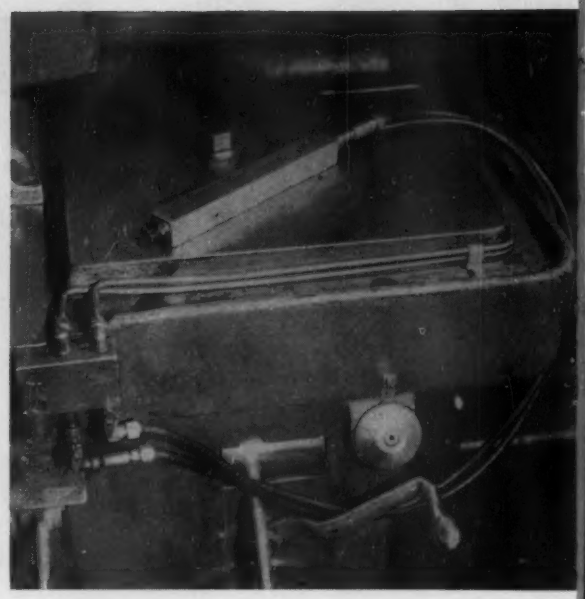
72-IN. LATHE has 6-gal injector unit on rear of carriage. Injector feeds mist coolant through ¼-in. ID tubes from distributor across carriage to manifold block on apron. Lathe spindle is driven at 1¾ to 140 rpm by 100-hp motor. Several thousand dollars were saved by eliminating coolant system and sump in foundation for this 30-ft-between-centers lathe

SHOE FOR 72-IN. LATHE is made in right- and left-hand models. ⅛-in.-ID stainless steel tube delivers mist coolant to drilled chamber to three 1/16-in. dia nozzle holes positioned to direct coolant along cutting edge of carbide tool

SPECIALLY DESIGNED spray shoes fit under tools in 72-in. lathe. Shoes are connected to manifold block on lathe apron with ¼-in.-ID synthetic rubber hose

When cutting was done dry, best results were obtained at 12 rpm, with 0.006 in. feed, and 1/64-in. depth of cut. Only a few lineal inches of facing could be cut before tool became too dull to continue cutting. When mist cooling was added to the operation, feed was increased to 0.012 in., depth of cut was changed to 1/16 in., and it was possible to turn the entire weld deposit before resharpening the tool. Unsuccessful attempts were made to increase cutting speed—12 rpm seems best for this job, even with mist cooling.

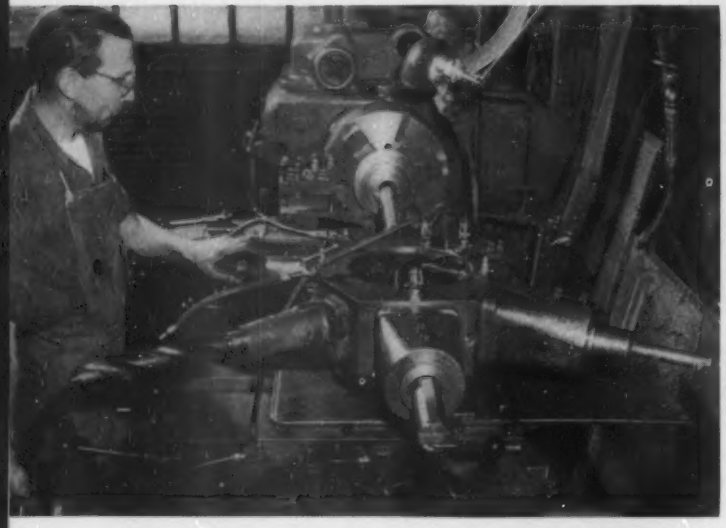
When turning or milling steel, mist cooling has been found satisfactory in most cases for roughing and semi-finishing cuts, where the nose of tool or cutter blade is buried in the work, and fairly stiff chips are produced. Cuts ⅝ to ¾ in. deep have been taken at 0.020 ipr feed when turning steel shafts in a tracer-controlled engine lathe. Similar roughing cuts—up to ¾ in. deep, with feed sufficient to provide 0.020 in. chip load per tooth—have been taken with carbide-tipped face mills machining flats on heavy steel castings in a large planer-type milling



spray shoes of another type, on a 32-in. lathe..

ANNEALED SAE 1045 bar stock 6¾-in.-OD is rough turned in 32-in. shaft lathe at 135-rpm, 0.021-ipr feed, ¼-in. depth of cut. Mist coolant comes from 6-gal injector unit on rear of carriage. Carbide-tipped tool lasts 3X as long as when cutting dry

ANOTHER KIND OF SPRAY SHOE, used under carbide-tipped tool on 32-in. shaft lathe, has two ⅛-in. dia longitudinal passages capped with pipe plugs, each drilled with a 1/16-in. nozzle opening in one of flats. This arrangement permits changing direction of each spray stream by turning plug



turret lathe, for both turret and cross slide...

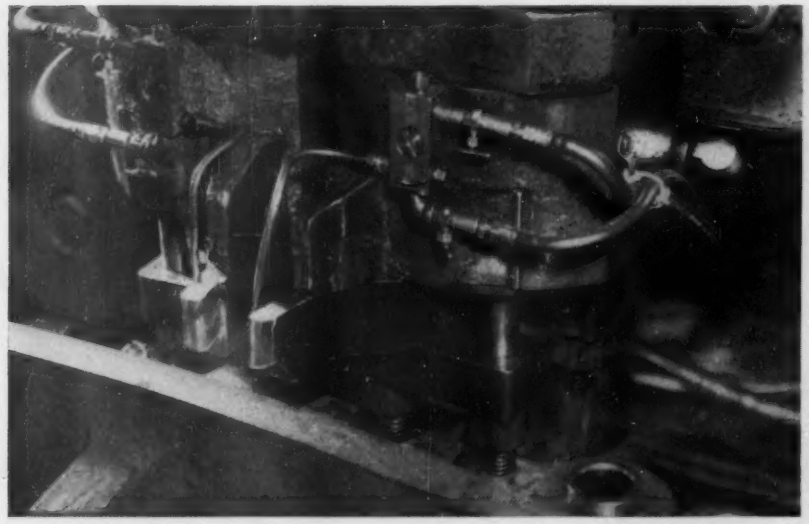
BOTH CROSS SLIDE AND TURRET of this lathe are equipped for mist cooling the carbide-tipped tools. Quick-disconnect couplings connect supply hose to each of the six turret tools successively moving into cutting position

EACH BORING BAR for turret lathe has drilled longitudinal passage for mist coolant leading to ⅛-in.-ID stainless steel tube nozzle at tool position. Nozzle is bent to follow contour of cutting edge, is plugged in end, and drilled with several spray holes to distribute coolant along cutting edge

or drilled tool shanks, turning chilled cast iron...

CHILLED CI FLOUR MILL flaking roll, 32-in. OD, 42 in. long, is rough and semi-finish turned at 1.8 rpm in two passes with double carbide-tipped tool setup using mist system supplied by 6-gal injector unit on rear of carriage. First cut is taken at 0.056-ipr feed; second at 0.169-ipr. Tool shanks are drilled for spray passages. Addition of mist cooling cut machining time 40%

EACH CARBIDE-TIPPED turning tool has two 1/16-in. dia spray holes in front face under carbide tip. Mist coolant is fed to holes from drilled chamber tapped for ¼-in. pipe connection to hose

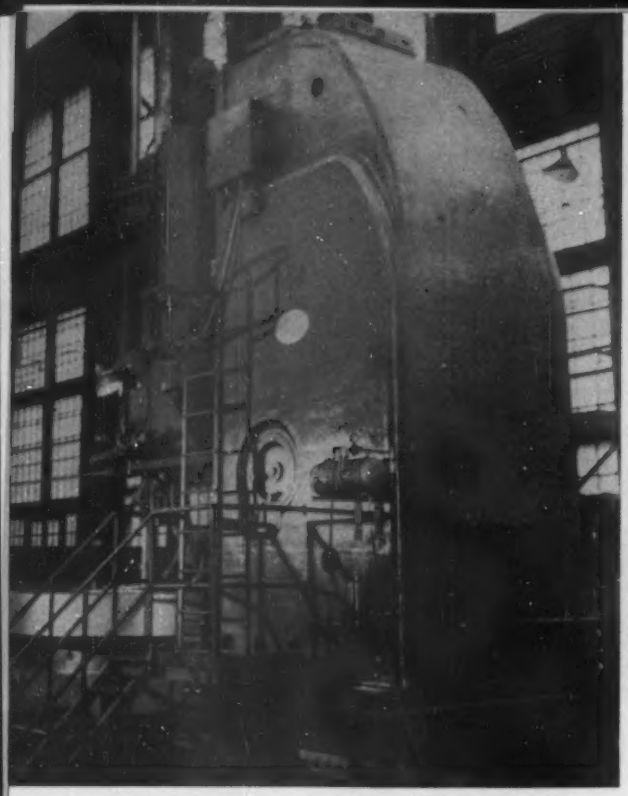


WORKING CONDITIONS around this large Allis-Chalmers vertical gear shaper were improved materially when mist cooling was substituted for the flood system previously used. Gears up to 19-ft 6-in. OD can be cut with this 48-in. stroke machine, which uses HSS tools

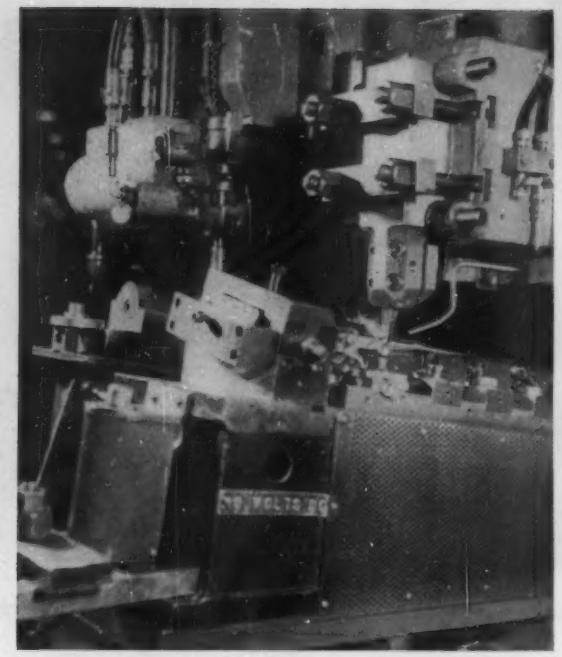
machine equipped for mist cooling of the cutter.

Mist cooling has not proven effective when taking light finishing cuts with broad-nosed tools on steel shafts and similar parts. Present practice in our plant is to mist-cool roughing and semi-finishing cuts. We then brush on or drip a mixture of kerosene and signal oil ahead of the cutting tool for finishing cuts.

For most metals a relatively "wet" (high ratio of fluid to air) mixture of coolant has given best results. This is especially true when machining cast iron, to minimize blowing of cast iron dust about the work area.



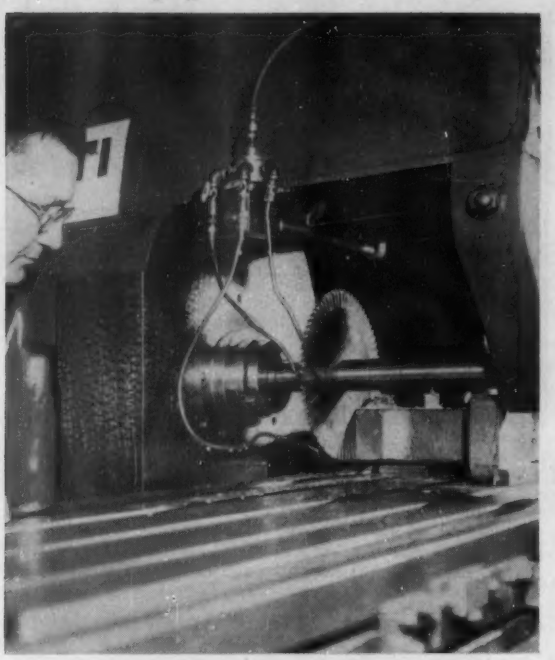
6-GAL INJECTOR UNIT feeds mist coolant to tools in holder on end of ram of this 78-in. vertical slotter through approx 38 ft of ¼-in.-ID copper tubing and flexible synthetic rubber hose. Tool life is increased 2 to 3X



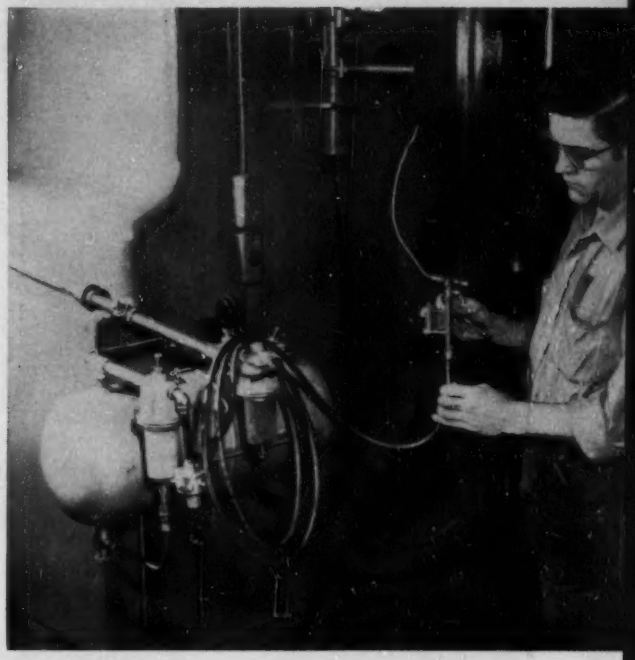
STAINLESS STEEL TURBINE BLADES are rough and finish contour-planed in this tracer-controlled hydraulic planer equipped with special fixtures. Blades 18 to 32-in. long are cut with HSS tool at 14 strokes per min, using 0.008 to 0.010-in. cross feed per stroke. Mist coolant nozzle on tool slide cools tool during roughing cuts. For finishing, mixture of kerosene and oil is brushed on work

PERMANENT MAGNETS hold each of four nozzles at required positions on columns of duplex miller, face milling a wide variety of steel and CI parts. Nozzle tubes have 1/16-in. orifices

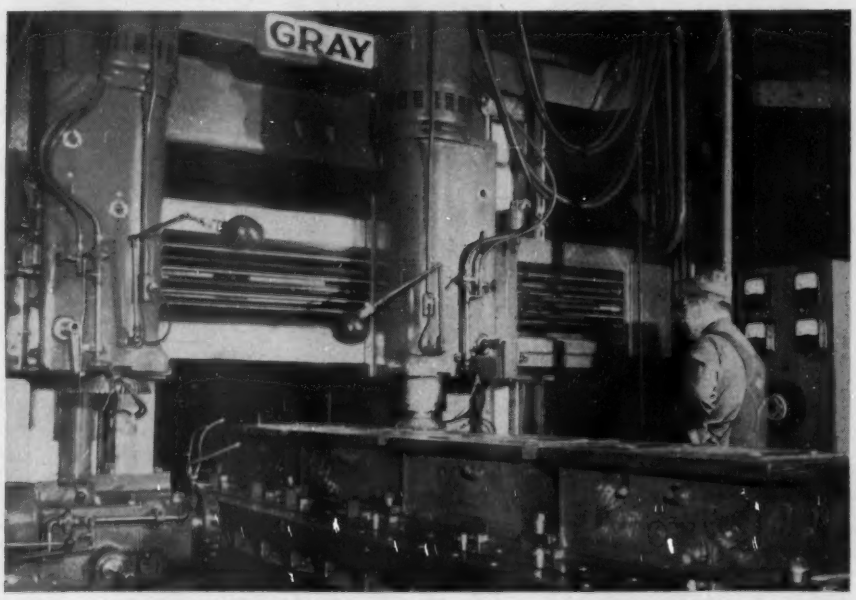
MIST COOLANT is fed to two ⅛-in.-ID nozzle tubes to face mill on vertical miller from distributor and injector made by inserting air tube into hole drilled in fluid line elbow and brazing joint. Adjustment of control valves in compressed air and flood coolant system supply lines controls fluid-to-air ratio



SAWING AND SLOTTING operations on milling machine with HSS or carbide-tipped cutters can be improved when cooled with three or more spray nozzles. Similar cooling arrangement is used when cutting ¼-in. wide, 2¾-in. deep radial slots in 24-in. long steel and CI rotors. Cutter life between grinds is doubled when cutting steel rotors, increased 4X when cutting CI rotors

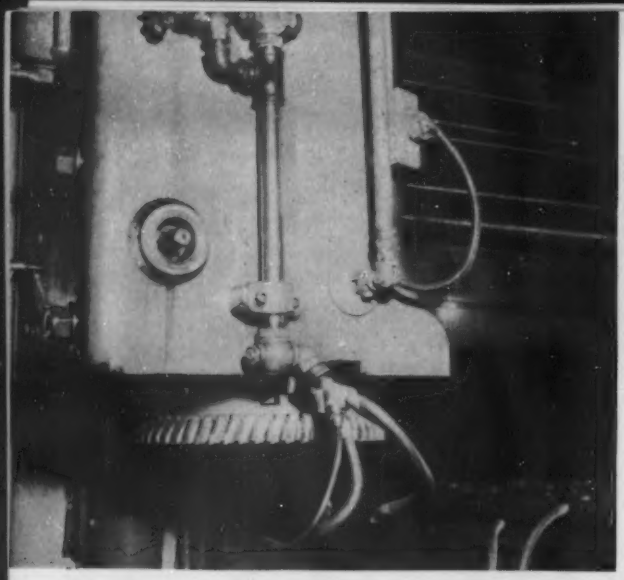


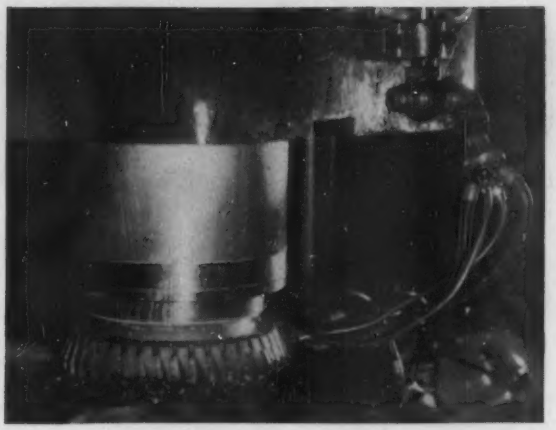
INJECTOR UNIT on column of 6-in.-bar boring, drilling and milling machine provides vaporized coolant for face milling operations, and for medium-depth drilling and boring operations. Nozzle assembly at end of 8-ft long hose is mounted on permanent magnet to simplify positioning of nozzle in various locations to suit work



EACH of the four 30-hp heads on this 4 x 4 x 18-ft planer-type miller is arranged for either flood or mist cooling of cutters by joining fluid and spray lines at Tee fitting, and selecting either by choice of valves. Distributors are used at each head

planer-type milling, with 3 kinds of cooling...

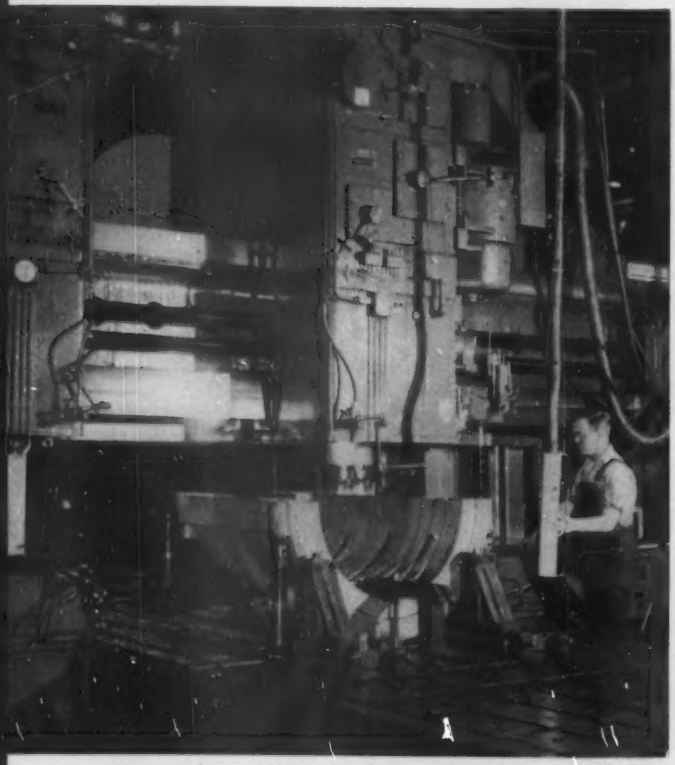


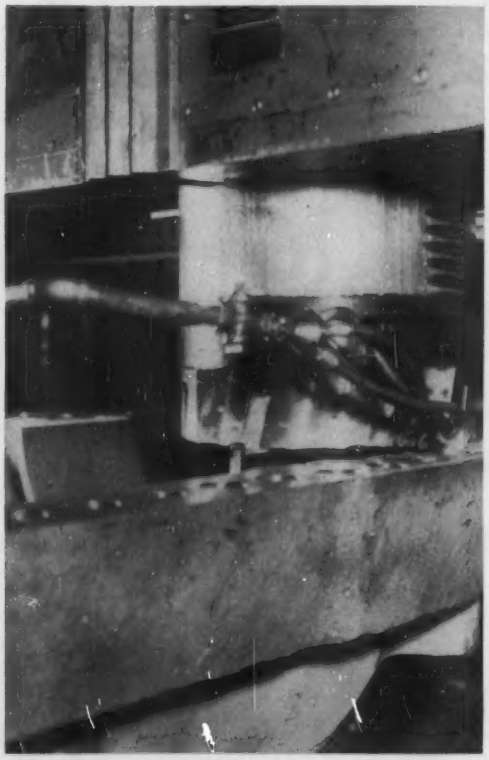


planer-type milling, with 3 kinds of cooling . . . (continued)

PIPING ARRANGEMENT on vertical head of planer-type miller to provide either mist or flood cooling through original piping is shown above. Injector unit is mounted on rear of machine and choice of mist or flood selected by valves. Distributor and metal or flexible nozzles provide cooling to face milling cutters or other tools

FOUR NOZZLES on this vertical head of planer-type miller cool 10-in.-OD carbide-tipped face mill roughing surface of welded steel baseplates at 82-rpm with 3/32-in. deep cut and 16-ipm feed. Finishing cut will be taken at 125-rpm, with 1/64-in. cut, same feed





more planer milling, with another kind of coolant selector . . .

EACH 75-HP HEAD on this 9 x 9 x 30-ft planer-type miller is arranged for either flood or mist cooling of cutters through Tee connection of fluid and air lines. With 14-in.-OD carbide face mill, cast steel casing shown is roughed at 60-rpm with 10-ipm feed. Depth of cut ranges from ¼ to ½-in.

SPECIALLY DESIGNED 14-in.-OD carbide-tipped cutter is used at 87-rpm, with 3½-ipm feed and 0.004-in. depth of cut to produce fine finish on joint faces of cast-steel steam turbine casing. Spray from four nozzles is concentrated over cut to produce good finish

DRILLING

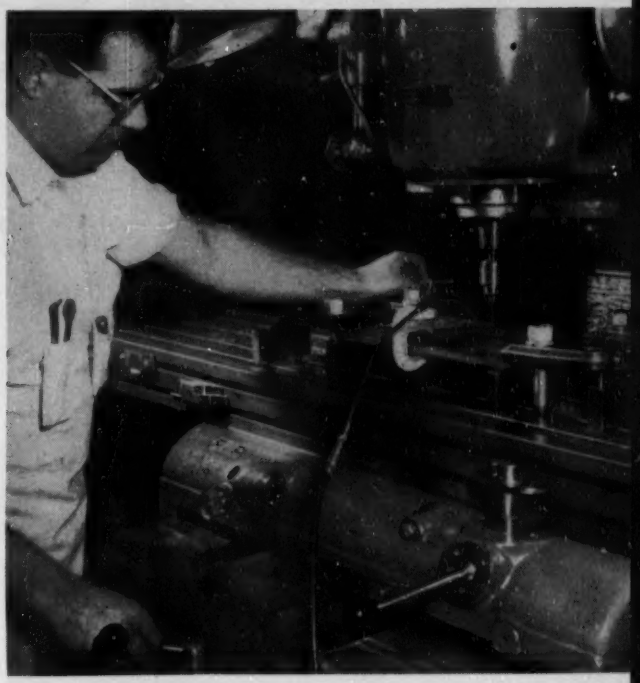
We have had interesting success when applying mist-cooling systems to 8- and 9-ft-arm radial drills, drilling naval bronze and steel tube-sheets for steam condensers. These sheets range from 1 to 1¾ in. thick, and tube holes are ¾ to 1⅛ in. diameter. From 4000 to 8000 holes must be drilled in each sheet. Until recently, conventional flood cooling systems supplied on the machines were used to cool and lubricate the drills. To catch the liquid drained off the sheet, 30 x 30 ft pans about 12 in. deep had to be provided at each machine. Also, constant splashing kept operators' clothes wet with coolant.

At each drill converted for mist cooling, the coolant hose was disconnected from the sump pump and connected to the 6-gallon tank of a mist injector unit mounted on brackets at the base of the machine. Thus the original hose and piping system is now in use, delivering the coolant-air mixture to the drill. Results include much improved working conditions, elimination of floor drain pans, and greatly increased (3X to 10X) drill life.

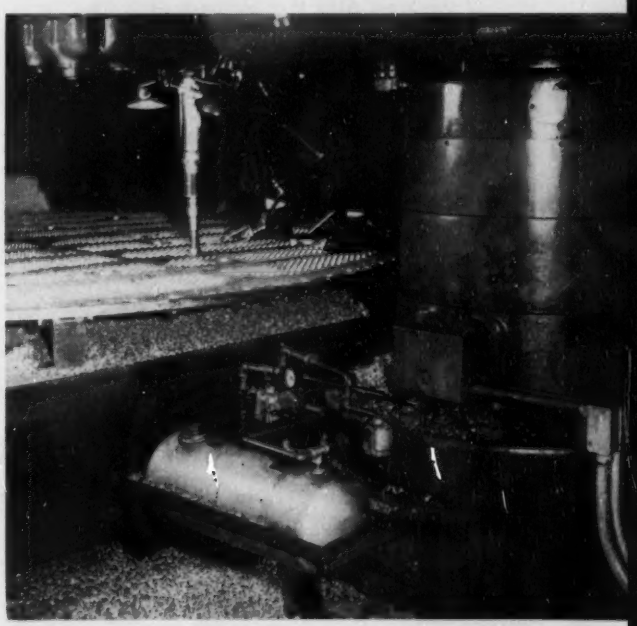
When flood-cooling drills on steel tube-support plates for steam condensers, common practice was to stack the parts in pairs, drilling two identical plates at once. Edges were tack-welded to insure alignment. With mist cooling, it is possible to drill twice as many plates at one time—four pieces are generally stacked and tacked before drilling. For the larger plates, that means that a ⅛-in. drill must pass through 4½ in. of metal. The mist system is also used for cooling countersinking and grooving operations in tube holes in the bronze and steel sheets.

When work is located in drill jigs with guide bushings, mist cooling is generally not effective unless coolant discharge nozzles can be positioned between bushings and work surface. For best results, jig design must take into account the need for directing coolant streams at an acute angle with the drill, and into the hole being cut.

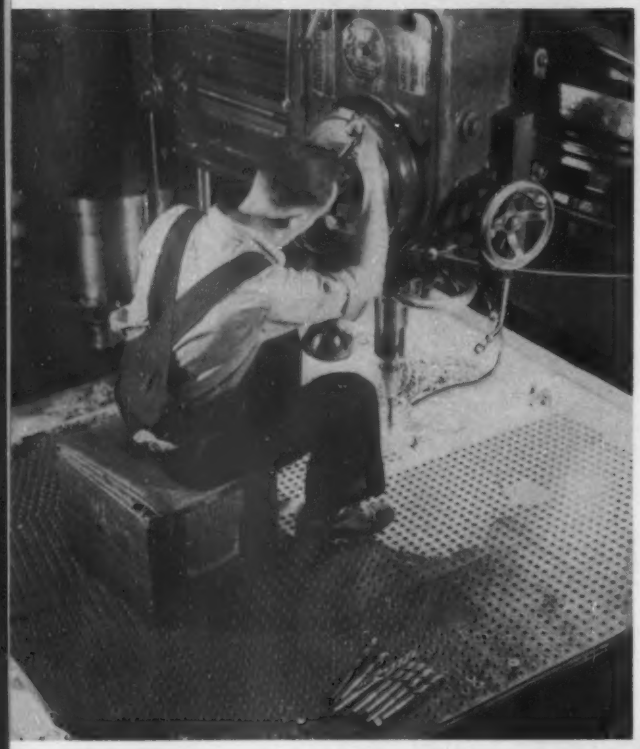
Best practice is to use two diametrically opposed streams on drilling, reaming, and tapping. Mist cooling has not been effective on drilling or reaming of aluminum alloys, as it does not introduce enough fluid into the hole to lubricate chips so they will move freely out of the flutes. However, mist has been successfully used when finish-reaming bolt holes in flanges of steel couplings.



SEVERAL HUNDRED 9/64-in. holes are being drilled in a ½-in. thick, Series 300 stainless steel screen plate in this experimental setup on a vertical mill. With mist coolant sprayed through almost vertical nozzle in drill guide block, up to approx 175 holes can be drilled without resharpening tool. Tests conducted drilling dry indicated drills would have to be changed every 3 to 6 holes



9-FT RADIAL DRILL used to drill, counterbore and groove tube holes in bronze end plates for steam condenser. 6-gal injector unit is mounted on brackets bolted to column base. Pressure is 20-psi



BEFORE...

DRILLING TUBE HOLES in steel or bronze condenser plates with conventional flood coolant system. Coolant splashes over operator's shoes and clothing, and covers layout marks. Large floor pans are needed to keep coolant off the floor

FLUIDS . . . EVALUATION

In mist-cooling systems now in use at the West Allis Works, the fluid is usually a 25-to-1 mixture of water and a carefully selected base. Coolant is made up as needed, by adding 2 gallons of base to 50 gallons of water in a clean 55-gallon drum, then agitating thoroughly.

Although our applications to date have been numerous and varied, with success ranging from negligible to excellent, we do not believe the full potential of mist cooling has been realized. The full possibilities can only be obtained by extensive application and experimentation, with cooperation of tool and production employees, and supervisors.

AFTER...

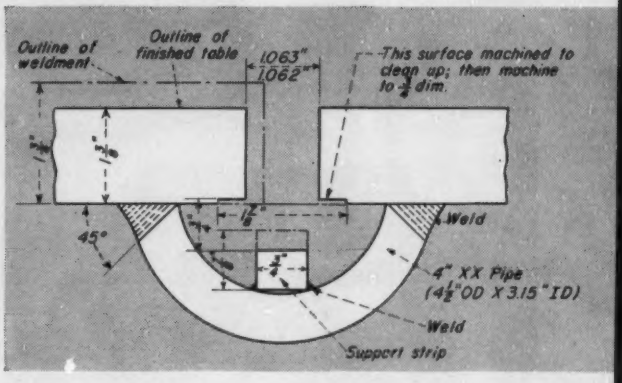
STEEL CONDENSER TUBE PLATES are drilled in stacks of four when mist system is used on 8-ft radial. Spray keeps chips away from layout marks, and working conditions are much better than when flood coolant system was employed. Drill life is increased 3X to 10X

part II . . .

Mist cooling helps some planer jobs...

Outstanding results have been noted at the Giddings & Lewis Machine Tool Co plant, when mist-cooling conventionally shaped HSS tools planing steel parts. Before mist cooling was applied to these jobs, tool life was low, finish was poor, and tools broke frequently.

Cuts taken with planer tools are usually such that it is easy to position the spray nozzles for effective cooling of both tool and work. Apparently lubricity of the coolant also helps the job, reducing or eliminating the tendency of chips to jam up ahead of cutting tools in long slots.



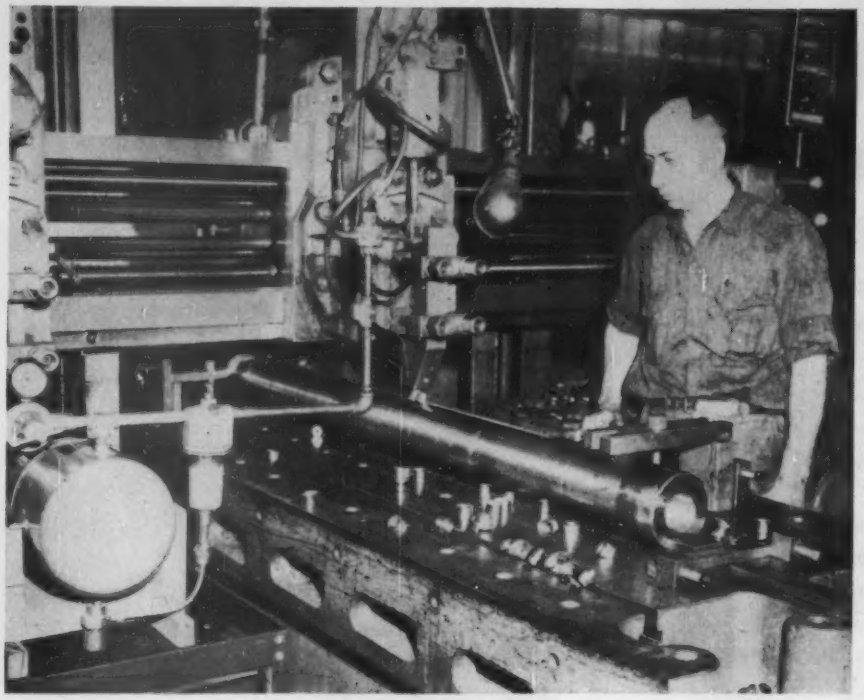
ONE OF THE MOST DIFFICULT PLANING JOBS we have experienced for some time consisted of cutting neck portions of T-slots in special welded steel table for skin miller. Table, 120 in. wide, has working-surface length of 40 ft, with 11 longitudinal T-slots spaced on 11½-in. centers. The 2 outboard slots were cut from solid, while the 9 inner slots were centered on gaps between 12 in. wide, 1¾ in. thick plates from which weldment was assembled. Gaps were irregular size and shape, because of variations in rough plates

Planing was first tried with clamped carbide bit in slotting holder. Bit was square on end, with 0° side rake, 5° back rake. Speed was 240 fpm, feed, 0.006 in. per stroke. Chips piled up in slot, and tip of tool overheated at corners, resulting in frequent tool breakage

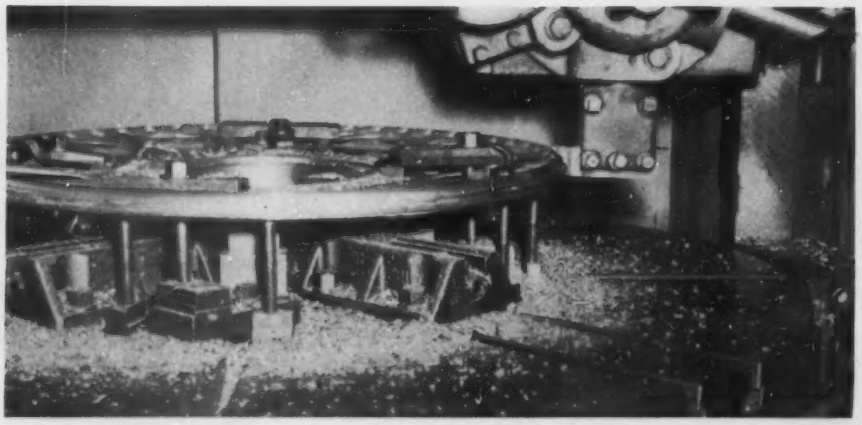
Next try was 18-4-1 HSS tool with 0° side rake, approx 10° arcuate (2-2¼-in. radius) back rake. Speed was reduced to 60 fpm; feed was kept at 0.006 in. When this tool was used cutting dry, heat developed, and chips fused, turning dark blue. Then two mist cooling nozzles were positioned to spray 16-to-1 mix (water to coolant). Chip came off in flat spiral, and was not discolored. (Chips shown (right), taken from outer, solid slot, are typical of chips from all slots in this job.)

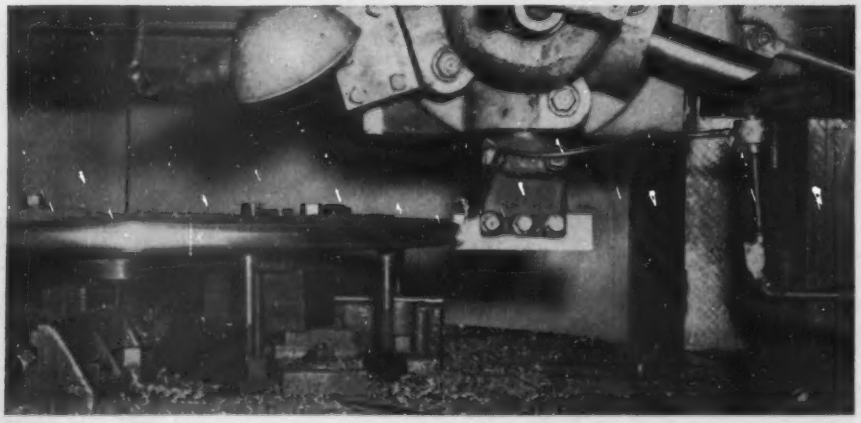
This job would have been difficult, if not impossible, without mist cooling. Spray in this and other pictures was enriched for photographic purposes

Mist cooling helps some planer jobs . . . continued



KEYWAYS in 4-in. OD forged Nitralloy G spindles (Bhn 207-241) are 0.575-0.580 in. wide, ⅜ in. deep, about 75 in. long. Tool is 18-4-1 HSS. Roughing speed is 30 fpm; feed is 0.008 in. per stroke. Before mist cooling (now standard practice) was applied on this job, oil was dripped onto work just ahead of cut. Finish was rather poor, and fumes were annoying. Mist cooling eliminated both these problems, and tool life was noticeably improved





PLUNGE-CUTTING form tool cuts ⅝-in. radius on 30-in.-OD cast steel handwheels. 3 cuts—rough, semi-finish, and finish—are taken at 8.8 rpm, with hand feed. Roughing tool cuts through casting scale, removing ⅛ to 3/16 in. of stock. Finishing tool removes 1/16 in. of stock. Without mist cooling (top), finished surface is rough, needs a lot of hand-polishing. Mist cooling (bottom), gives smooth, bright surface, with only a little polishing needed

...but mist cooling doesn't help these

All tests made to date in the applications shown here used a stand-mounted portable Acro Lo-Jet injector assembly equipped with a 3-gallon tank. Flexible synthetic rubber hose lines connect the injector to ⅛-in.-ID nozzle tubes needed to direct the spray. It is easy to move the unit to any planer in the shop, and make a quick test setup.

These examples of successful applications do not mean that mist-cooling is a cureall for planer problems. We have not yet found that mist offers any advantage when planing cast iron, or when planing steel with carbide tools.

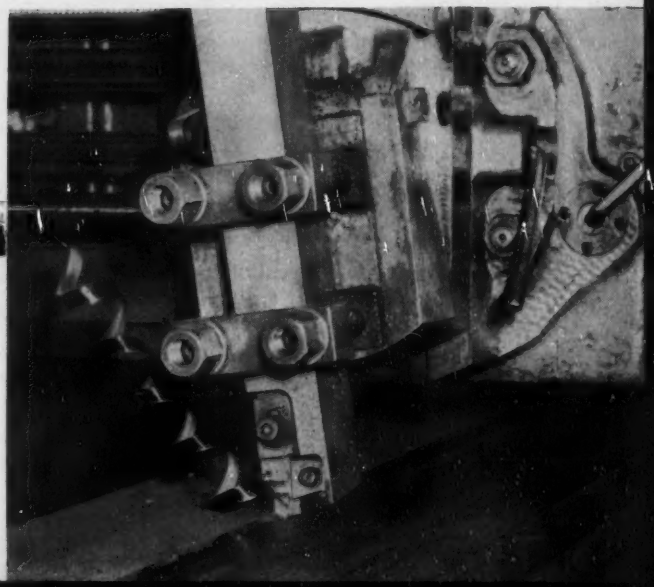
On cast iron, mist cooling has been tried on a number of planer and boring mill applications, without any appreciable increase in tool life. This is particularly true when slotting with planers, where the mist doesn't counteract abrasive action of fine cast iron chips and dust which cause rapid tool wear.

When slotting some cast iron vertical boring mill tables, however, tool life has been improved by directing an air blast into the slot ahead of the tool, keeping chips from piling up against the front face of the tool. Perhaps this idea can be adapted to other slotting operations.

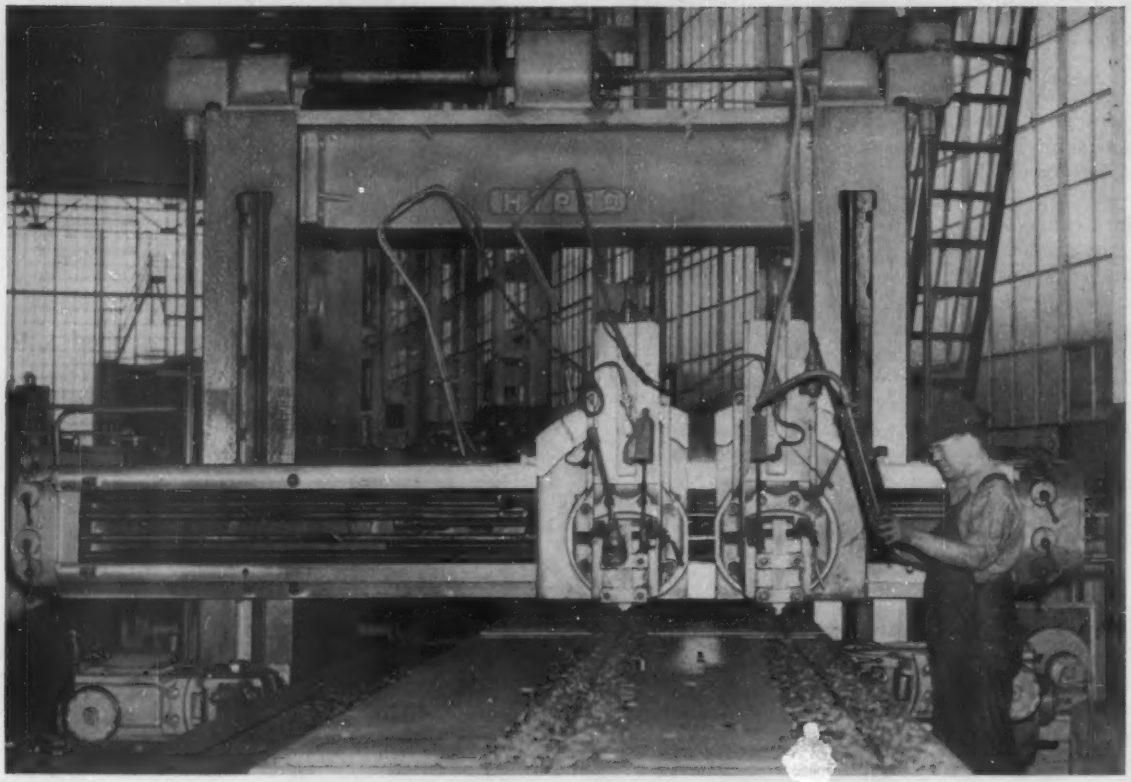
When planing with carbide-tipped tools, mist cooling keeps the carbide tip cool. However, tool life has not been improved in a number of trials when roughing the neck portion of T-slots in cast iron tables for planers and horizontal boring, drilling, and milling machines.

As of now, keeping the carbide tip cool or cold with vaporized coolant tends to cause built-up edge.

BLAST of compressed air, when cutting neck of T-slot for G & L planer, keeps chips from piling up in front of tool. Tool life is materially increased



EXTENSIVE MIST COOLING TESTS gave adverse results when planing the four surfaces of this steel underarm weldment, 12 x 14 x 164 in. Edge of carbide tip is apparently kept so cool that built-up edge develops quickly, giving rough surface. Also, chip adheres to tool, often catching on work during return stroke. This leads to chipping of edge of carbide where chip is welded on tool. Present speed is 300 fpm (top speed of the machine), and feed is 0.045 in. per stroke. Tool, held in Davis toolholder, has negative side rake, positive back rake. On this same part, mist cooling is used to aid 18-4-1 HSS slotting tool cutting 0.510-in. wide, 0.150-in. deep longitudinal slot on one side of part. Speed on the slotting operation is 30 fpm; feed, 0.005 in. per stroke



MIST COOLING does not help this job, roughing neck portions of T-slots in cast iron tables. Cuts are long, and tool wears quickly because of abrasive nature of chips

Tentative conclusions at G & L

Mist cooling can often be helpful when planing steel with HSS tools, especially when making long, deep slots. Best results occurred when tool life had previously been short, with poor finish and broken tools.

In such cases, mist cooling:

a) Effectively cools tool tip, chips, and work. This method of applying coolant results in rapid expansion of coolant leaving the discharge nozzle near the tool tip. Some elements in the coolant may evaporate, thus further aiding heat removal.

b) Lubricity of the coolant is believed to aid flow of the chip out of the cut and over the tool, greatly reducing the tendency of chips to jam ahead of the tool.

Mist cooling is ideal for planers because:

a) Planers are not ordinarily equipped with coolant-collecting systems which would be needed for flood cooling. This means that any conventional planer can be equipped for mist cooling. Equipment can be completely portable and can be taken from planer to planer for jobs which require cooling.

b) The kind of cut usually taken on a planer is such that the coolant can be constantly directed against the cutting edge of the tool. Seldom, if ever, does a situation arise similar to deep-hole drilling, where it is almost impossible to direct vaporized coolant into the cutting edge.

c) When mist cooling on a planer or boring mill, there is no tendency to blow chips and other foreign material into an operator's face. Instead, a properly directed pressurized spray effectively keeps chips away from the operator.

d) Mist cooling will probably replace the old method of dripping or otherwise applying a cutting oil to the job where cooling is needed. That means that smoke and fumes often seen (and smelled) around a planer job can be a thing of the past.

Round Table

Spot Demotion

"The grapevine tells me Browning's really mad about getting demoted from the jig borer, Ed."

"That wasn't a demotion, Al. I just moved Harmon in because we had some tougher jobs coming along and I thought he'd handle them better. After all, Browning's only worked on a borer for a few months."

"Well, he must have taken it too much to heart, Ed. I understand his feelings are hurt, and he's even thinking of looking for another job."

"That's tough, Al! Since when can't I shift my men around without getting criticized from everyone, including the sweeper?"

"Hell, Ed; I wasn't criticizing you. I was just reporting what I'd heard."

"I know, Al. Actually, I heard about the same thing myself. I'm trying to figure out what to do about it."

"Didn't you tell Browning why he was getting shifted?"

"Oh, I told him something, I guess; I've forgotten what. But I'm not in the habit of explaining everything to everyone I give an order to. I think Browning's out of line in expecting to stay on the machine; he knows I often shift the boys around — just so they'll all get the experience."

"He seems to think he got demoted, though. After all, that grinder is an easy machine to run."

"He got big ideas because I tried him on the jig borer; that's what started the trouble. But I did that because he fouled up a couple of boring jobs that Harmon would have breezed through."

"Didn't you tell him that you thought he'd goofed?"

"Well, I may not have mentioned it. I don't usually try to hurt a man's feelings if I can help it."

"I guess that's the trouble, Ed. Sometimes you can get off easier by being blunt; then the guy doesn't get a chance to start feeling sorry for himself."

"Browning's being an old woman about this. I probably would have moved him out in a couple of months, anyway, just to give someone else a crack at that high-precision work."

"Maybe you should have explained the situation to him on that basis, Ed."

"Now, there I disagree, Al. Either I run this department, or they get someone else. Those guys are going to work where I tell them, or I'll resign."

***IS ED** being unnecessarily bull-headed about not telling his men all the reasons? Is Browning foolish for reading too much into the change, or did he deserve a detailed explanation? Your opinions can be of value to others. Discussions of earlier topics appear on later pages.*

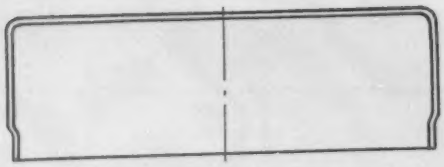


Fig. 1

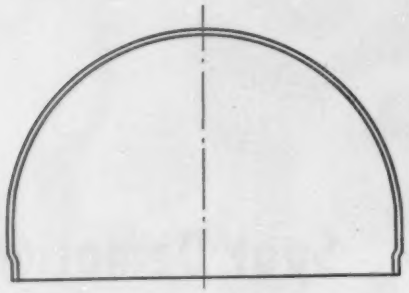


Fig. 2

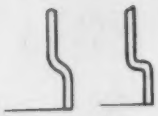


Fig. 4

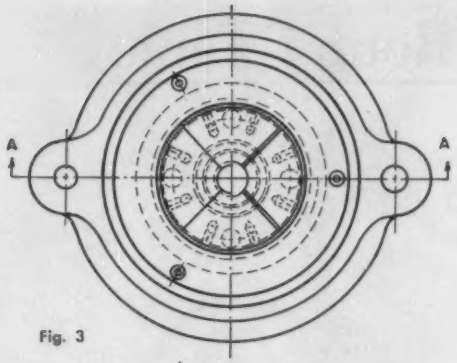
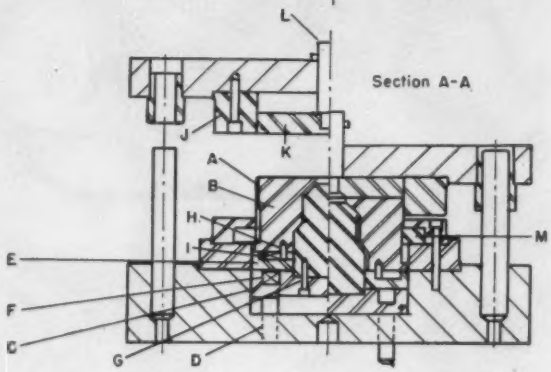


Fig. 3



FIGS. 1 TO 4 . . . Offsets are produced by reducing the open end of the shell in a segmental die. The die segments are forced outward into the body of the shell to prevent wrinkling while the open end is pushed through reducing ring M

Cope Talks on Draw Dies...XVI

Make offsets in dies or on lathes

STANLEY R COPE, president, ACME SCHOOL OF DIE DESIGN ENGINEERING, SOUTH BEND 1, INDIANA

Small offsets, as shown on the shells in Figs. 1 and 2, are made in segmental dies similar to that shown in Fig. 3. If the open end of the shell is offset for a distance equal to only one thickness of metal (Fig. 1), the offset may be formed complete in one operation. If the offset is greater than one thickness of metal, two operations are generally required. The end of the shell is reduced in diameter over a large radius as far as possible in the first operation. Then, the radius is sharpened and the offset is reduced to the final diameter in the second operation. See Fig. 4.

The operation of the die is as follows: Shell *A* is placed over segments *B*, which are normally held in a raised position by pad *C* and pins *D*, as shown in the open view at the left of the centerline. The segments are mounted on plate *E*, which is held a short distance above the top of the pad by springs *F*. They are held inward against cam *G* by pins *H* and springs *I*.

When the slide descends, ring *J* slides down over the sides of the shell, and knockout plate *K* bears against the top of the shell and pushes the segments and plate *E* downward until the latter contacts the pad. During this action the segments are forced outward into position by cam *G*. Continued descent of the slide caused pad *C* to travel downward. The open end of the shell is reduced in diameter or is offset by being forced into ring *M*, as shown in the closed view of the die at the right of the centerline.

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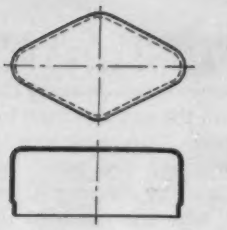


Fig. 5

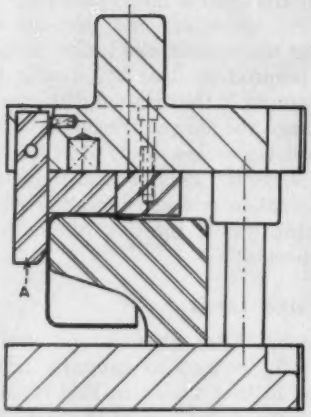


Fig. 6

FIGS. 5 AND 6 . . . Notches are cut in the curved portions of non-round shells, and the shells are then offset in a horn die fitted with a spring finger *A*

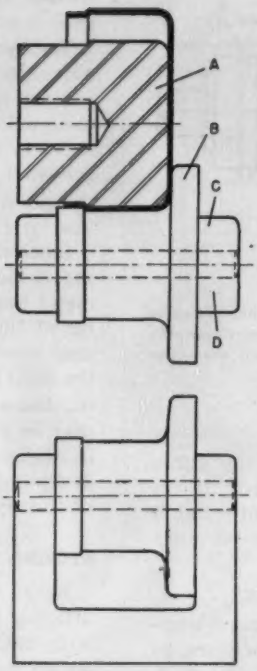


FIG. 7 . . . Offsets can be necked on round shells by slipping them on a chuck *A* and applying pressure with roll *B* mounted on cross-slide of a trimming lathe

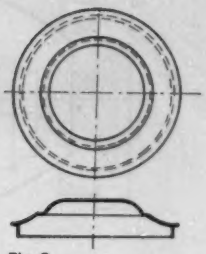


Fig. 8

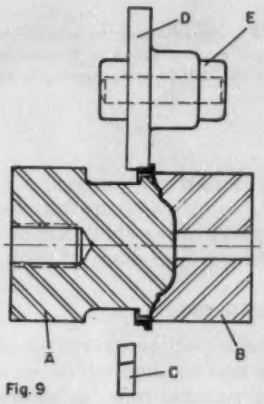


Fig. 9

FIGS. 8 AND 9 . . . Extensive offsets on shallow shells are formed "on air," using special tooling on a spinning lathe. Tool *C* is used to trim the end of the shell offset

You can employ segmental dies, horn dies or special setups on beading or spinning lathes to make offsets on the open end of shells. The choice of method depends on the extent of the offset, the shape of the shell, and production required

When the slide ascends, pad *C* ejects the shell from the die, plate *E* is returned to its normal position by springs *F*, and the segments are pushed inward by pins *H* and springs *I* to release the shell. The shell rises inside of ring *J* and is ejected near the end of the up-stroke by knockout plate *K* and rod *L*. Dies of this type can be used to offset non-round work, as well as round work, provided that the corners or other curved portions of the shells are large.

OFFSETTING IN HORN DIES

When the curved portions of non-round shells are too small (Fig. 5) to permit offsetting in a segmental die, the shell should be notched at intervals around its periphery and then offset in a horn die. A suitable die is shown in Fig. 6. Several strokes of the press are required to form the complete offset. The open end of the shell is slipped over the horn and is held in position either by hand or by a spring finger (shown at *A*). A spring-actuated pressure pad is arranged to grip the work and hold it in place before the offsetting punch strikes.

Notches are necessary in the sides of the shell so that each portion of the offset can be formed individually without the need of the offsetting punch overlapping previously formed portions of the work. Notches should be cut in the curved portions of the shell so that the offset may be as rigid as possible. If the shape of the shell permits, the notches should

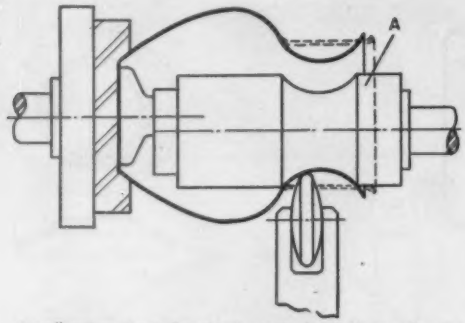


FIG. 10 . . . By offsetting the tailstock of a spinning lathe, and using a special shaping roll *A* in conjunction with an ordinary spinner's roll on the outside, deep necking is performed on items like water pitchers

be arranged so that one die can offset the entire shell, using as many strokes as required. If the periphery of the shell cannot be divided into similar sections, two or more offsetting dies will be required.

ROLLING OFSETS

Shells may be necked or offset in ordinary trimming and beading lathes, or in rolling machines, by using suitable rolls, as shown in Fig. 7. Chuck *A*, which is somewhat smaller in diameter than the necked portion of the shell, is fastened to the spindle of the lathe. Roll *B*, which is held in holder *C* and revolves on pin *D*, is then brought against the shell to form the offset. A large flange is turned on one side of the roll to push the shell against the chuck and hold it in position during the operation. Holder *C* is mounted on the cross-slide of the lathe and is moved inward by means of a lever. Both chuck and roll are made of hardened and ground tool steel.

If the necked portion of a shell is shallow and extends nearly to the top of the shell, as shown in Fig. 8, the offset may be formed "on air" in a fixture similar to that shown in Fig. 9. In operation, the shell is placed in chuck *A*. Female tail block *B*, which is fastened on a spinner's ball-bearing chuck to enable it to revolve with the work, is then brought into contact with the shell. Trimming tool *C*, which is mounted in a holder, and can move from left to right, is moved sidewise by means of a lever to trim the shell. Roller D, which is mounted in holder E, is moved inward to form the offset. The speed for this type of operation is 1000 rpm.

Since the flange of the shell is not "backed up" or supported during the operation, and because the metal must fold over upon itself, the larger diameter of the shell is reduced by 2 or 3% during the operation. As an example, if the original diameter of the shell is 3.500 in. and the flange is necked to 3.115 in., the outside diameter of the shell after rolling may be as small as 3.400 in. This natural reduction in diameter must be taken into consideration when designing the drawing die, if the final dimensions of the shell are important.

NECKING IN A SPINNING LATHE

Large shells, such as water pitchers and similar articles, are frequently necked in spinning lathes with fixtures similar to that shown in Fig. 10. The dotted line indicates the metal line of the shell befor the metal is spun in. The lower part of the shell has already been bulged out in a previous operation.

The tailstock of the lathe is offset to permit the use of a one-piece form roll, or shaping roll, as shown at *A*, to avoid the use of sectional chucks. The roll is brought to bear against the inside of the shell, and the metal is worked into it, with a regular outward spinning roll mounted on the compound rest of the lathe. Spinning lathes are provided with a cross adjustment on the tail stocks to permit offsetting them for necking operations.

Part XVII of Mr. Cope's series will appear in an early number.

"I don't care if you do have a rough spot on your plate, Brady, you're holding up production."

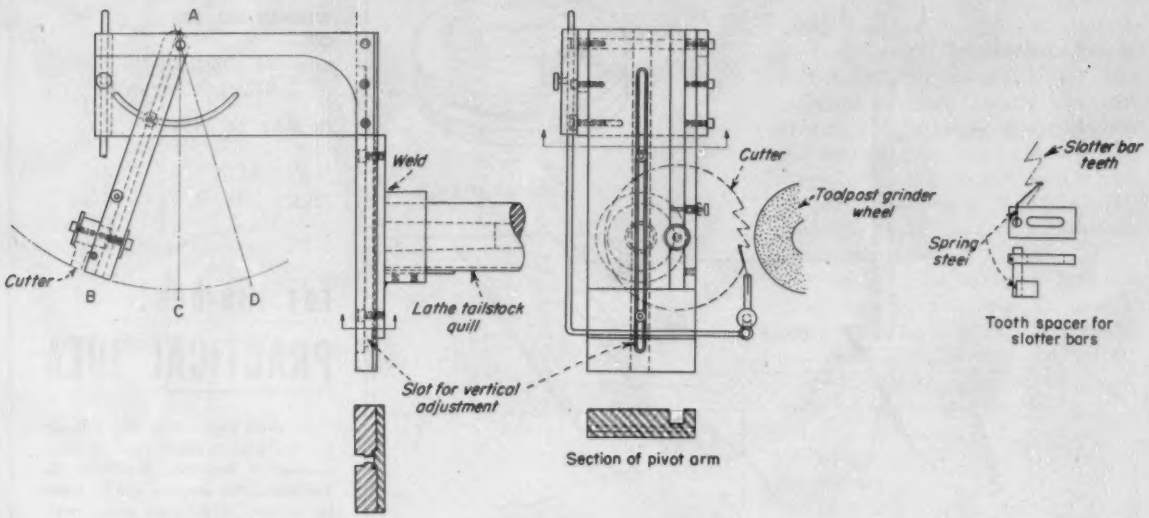
Tips

FOR TOP SHOP MEN

480 "The one best way" is a glib phrase, but only a phrase. Your company's or your personnel's "best" may not be the ultimate but may be the best for your conditions. "Best," for your organization, must include consideration of your plant's equipment, techniques, understanding, and confidence.

481 Watch for clouds on the horizon—the little indications of trouble that are not yet real problems. Watch for slight indications of slackness, for poor personnel policy, and the like that may let your organization drift into trouble unless they're stopped *now*.

Practical Ideas . . .



Fixture Sharpens Milling Cutters On Lathe

Our electric-motor repair shop does general repair work, requiring considerable milling machine and keyslotter work. However, we don't do quite enough of such work to warrant buying a special cutter grinder to keep these cutters in condition. Until recently these cutters were sent out for sharpening.

To avoid the need for sending this work out, we built a lathe fixture which is fairly simple to construct, and is quite flexible. Now we can do our own sharpening of regular, staggertooth, helical, and dovetail cutters, and keyslotter bars. Staggertooth cutters are ground by swinging the pivot arm to position A-B for teeth on one side of the cutter, and then swung to position A-D for the other teeth. The edge of a tooth may either be indicated, for horizontal alignment, or a gage block can be set on the compound and the vertical adjustment capscrew slightly loosened, leaving the pivot arm free. Then the cutter is lowered to the block, and, when the cutting edge shows horizontal, the pivot arm and vertical adjustment are tightened.

Regular cutters, spiral cutters, and slotter bars are sharpened in position A-C. For helical cutters, the spring-steel tooth positioner should be mounted on the carriage. For bevel or dovetail cutters, the compound is swung to the proper angle, and horizontal feed done with the compound. The compound is swung to 90° for slotter bars. The compound is then used for depth of cut, and the crossfeedscrew gives horizontal feed. Horizontal carriage movement or tailstock quill movement may be used for horizontal feed. Crossfeed can be used to regulate depth of cut for regular and staggertooth cutters.

The vertical adjustment allows the cutter to be raised and lowered to give proper clearance angle with respect to the toolpost grinder wheel. *Contributor unknown*

Ed: We occasionally receive material with no name or address on the contribution. To make sure you get proper credit (and payment) please include your name and address on all letters. (It would help if you'd mark sketches too.)

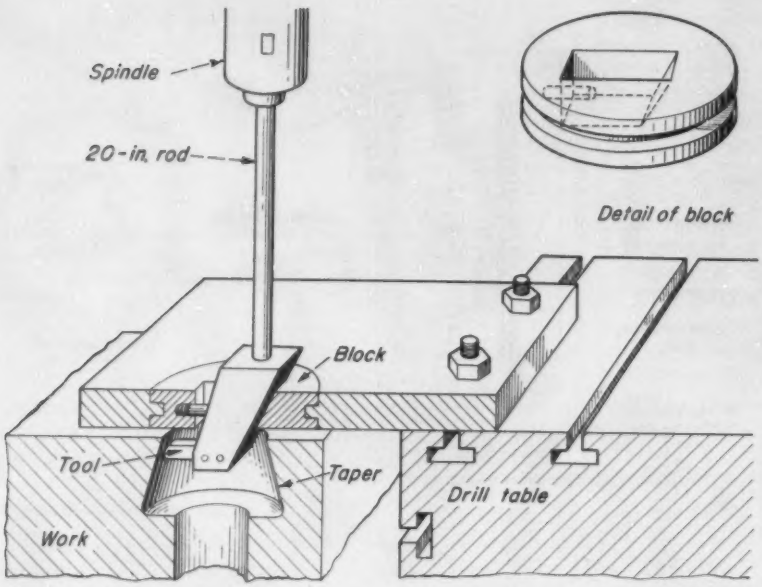
"Donuts" Make Good Parallels

We have had a few accidents in our shop when parallels fell over when work was being positioned on them. To avoid this trouble, we have made circular parallels of steel pipe and tubing. The tubing is cut to length, faced off, chamfered, and formed into short rings.

All the small diameter rings are made to the same height, so they can be used together if desired. The larger diameter rings are made higher.

These "donut" parallels are very easy to make, and can be casehardened and ground, if desired. They are light and easy to carry.

Tubing sizes can be selected so the rings will nest together for storage, and a single ring replaces two ordinary parallels. *Henry George, Bronx, NY*



Rotating Guide-Block Aids Taper Cut

The setup shown here solved a very difficult problem. We had to produce a reverse-tapered counterbore in a large steel casting of such shape that it would have been difficult to chuck in a lathe.

With the castings already secured to the table of a radial drill, we made a rotating toolholder so the work could be done in the same setup. The tool is essentially a toolholder with a tapered side, riding in a revolving guide-block. As the tool is fed downward, the cutting tool "rides" down the taper, cutting the back-tapered counterbore.

A spring-loaded block rests against the front of the toolholder, tending to reduce chatter. The front of the tool can be either vertical or tapered to correspond with the taper on the back of the holder.

The rotating block should, of course, be well lubricated.

If the diameter of the counterbore is large in relation to the drilled hole, an adjustable wedge can be put behind the toolholder, so that several cuts can be taken. *S Hahne, Huddersfield, England*

Paper Makes Magnet Easier To Use

When we were separating some steel chips and silver chips which had gotten mixed together by mistake, we had quite a bit of trouble getting the steel chips off the magnet. (We were using a pretty good sized magnet from a surplus gyro.)

By holding an ordinary piece of paper between the magnet and the chips, we found that the job was made much easier. *Laurence H Austin, Butler, Penna*

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An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

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JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

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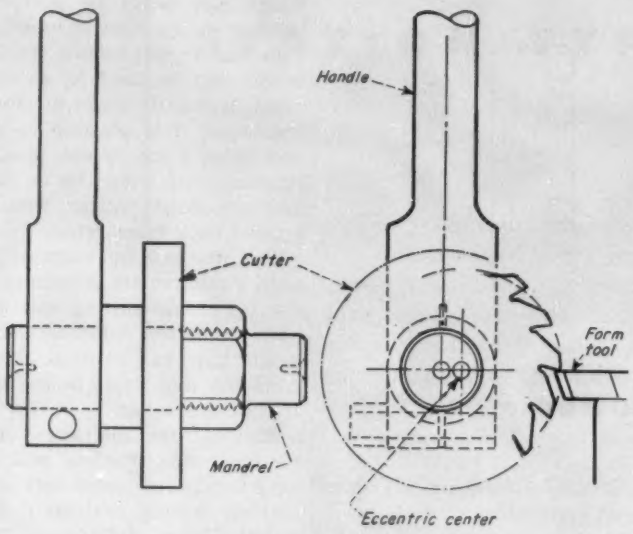
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y



Eccentric-Mounted Mandrel Relieves Form Cutters

Form cutters can be very easily relieved with this inexpensive tool. The tool is essentially an eccentric-mounted mandrel which is used between centers on a lathe.

To use the tool, mount the cutter, which has previously been gashed, on the mandrel with offset centers, and tighten the nut and collar. The mandrel is then placed between centers on a lathe. A form tool with the appropriate shape (ie with the "female" to the "male" cutter), is placed in the cross slide of the lathe, with the top of the tool on the axis of the mandrel.

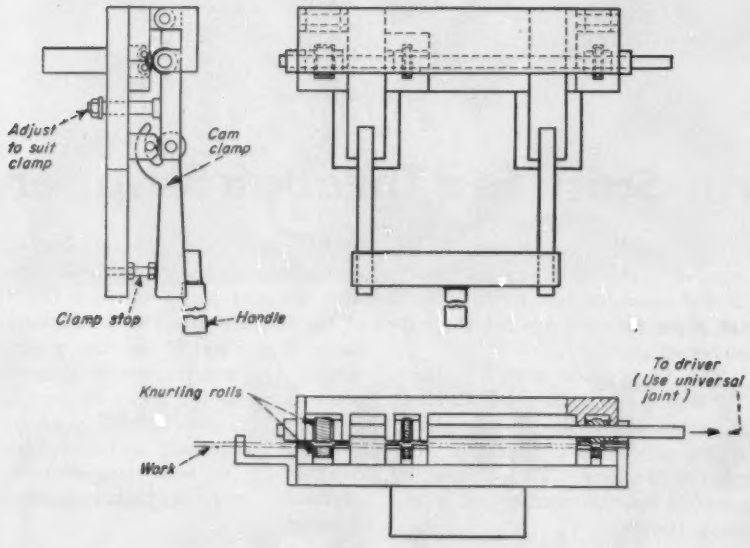
A tooth of the cutter is brought down against the tool, as shown. Then the cross slide is moved back, and gradually fed into the cutter, while the cutter is rocked back and forth on the eccentric centers.

Layout dye should be used on the top of the cutter form, to guide to proper depth.

The teeth will be relieved radially from the offset center. The tops of the cutter teeth are ground in the usual way after hardening.

Although quite a bit of care must be used when relieving with this method, the trouble caused is more than made up for by the simplicity of the tooling required. *George W Wilson, Mankato, Minn*

Bench-Tool Knurls Piano Wire

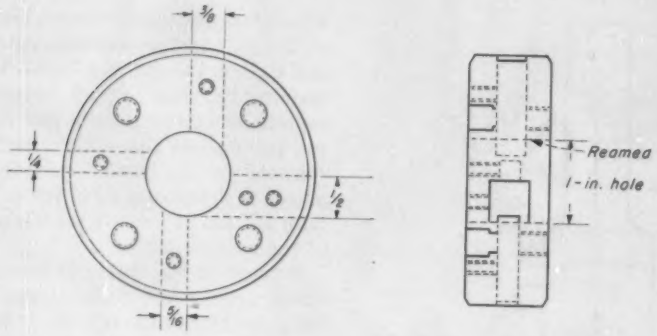


We had to knurl 2 pieces of piano wire 0.100-in. dia and 8 in. long. One wire had three knurled spots; the other had one spot. With end-stops on the left end of the fixture, the two pieces of wire could be knurled in one fixture, as shown.

A 2:1 ratio was selected to bring the knurling rolls in contact with the small-diameter wire. The upper rolls, which were larger and did the driving, were keyed to the shaft and had 72 serrations. The lower rolls had 36 serrations.

The fixture was set up on a bench, and the driveshaft end was hooked up to a set of sheet-metal rolls which were then run continuously at slow speed. With proper tension under the cam clamp, the job was ready to run.

It took about 15 to 20 revolutions of the driver to complete the knurl. The wire was then cut to length and straightened on a multi-slide machine. *Ernest F Siebold, Philadelphia, Penna*



Easily Constructed Flycutter

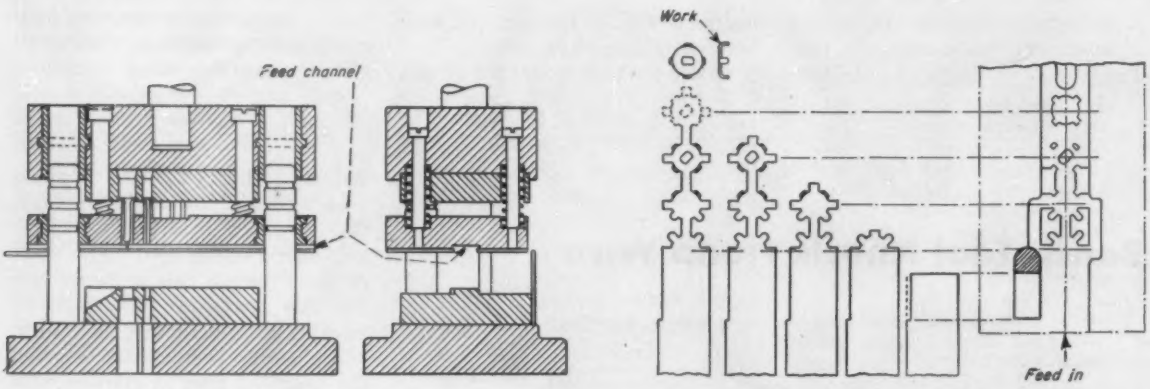
We do a considerable amount of experimental milling, and wanted to avoid costly grinding and renovating of standard cutters. To do this, we made a flycutter that has a wide range of application.

The tool has four slots, holding four different sizes of toolbits, which can easily be ground by hand or on a surface grinder.

In many jobs, more than one toolbit may be used. By extending one tool slightly lower or ahead of the other, it is possible to rough and finish a job in one pass. The roughing tool would be on center, and the finish cutter would be ground back from center.

Toolbits can be accurately set with a micrometer, checking from the tip of the cutting tool to the bottom of the adapter. Also, a height gage can be used, checking from the tool point to the top of the milling arbor.

Easy to make, and rugged enough for most jobs, this tool will prove very handy for toolmakers or machinists milling intricately shaped pieces. *John McCafferty, Patchogue, NY*



Progressive steps

Lock-Washer Strip-Stock Fed Through Stripper

Several hundred thousand lockwashers are produced yearly with this rather unusual progressive die. Stock for the die is fed through a channel in the stripper plate, instead of conventionally across the top of the die.

This design was chosen because the four legs on the washer project downward. If stock were fed through a channel in the top of the die, the strip would have to be lifted between strokes, to clear the legs. With the method shown here, all the operator has to do is feed the stock forward against the cut-and-stop punch.

The die is made with 5 stations. The first station cuts out a tab along the edge of the die, the length of which serves as a guide for successive feeding. The remaining punches cut the washer out in the steps shown.

The comparatively small punches are supported by the spring-actuated stripper plate, which is made of hardened steel. The 2 toolposts have a sliding fit in the plate, which has bearing metal poured around the sliding areas, as shown.

Production with this die is about 4000 parts per hour, and operation of the die is very trouble-free. *Hjalmar Dahl, Upplands Vasby, Sweden*

FOOTBURT

STATION TYPE MACHINES

Production-wide engineers in leading automotive plants are specifying Footburt Station Type Equipment on cylinder blocks and cylinder heads as the most advanced method in quantity manufacturing. Similar operations that ordinarily require several separate machines are grouped in one station machine, thus greatly reducing handling and providing better production control. Combining of valve hole operations, cylinder boring, the majority of drilling and tapping operations are outstanding examples of this latest production trend.

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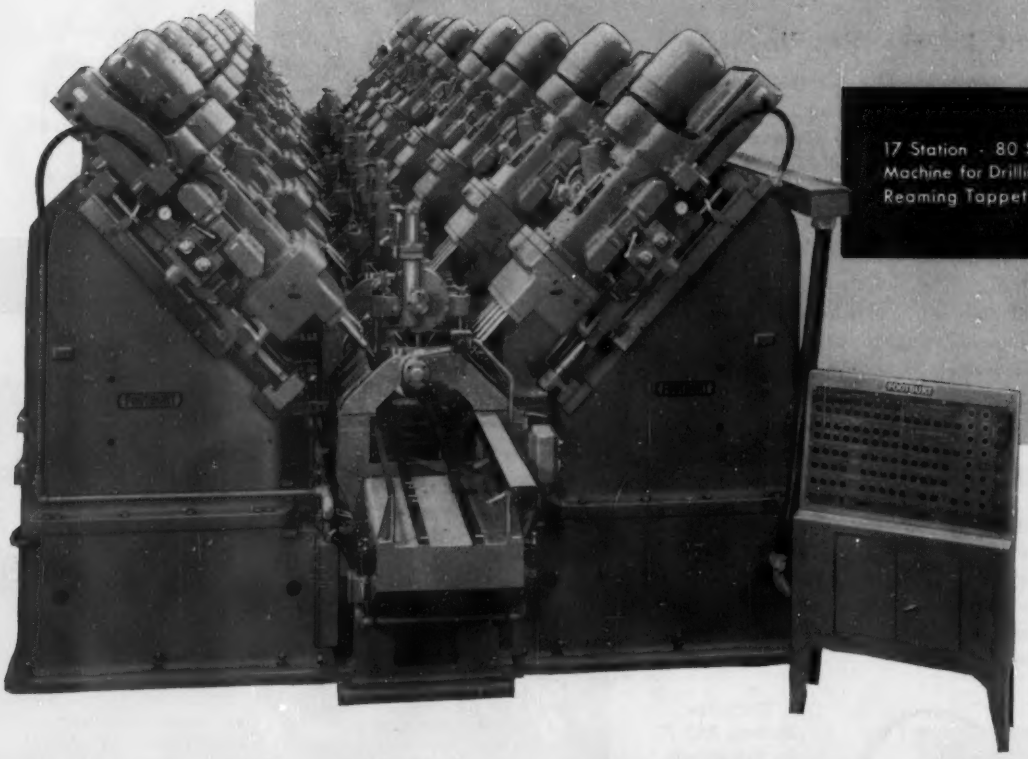

17 Station - 80 Spindle Machine for Drilling and Reaming Tappet Holes.

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MACHINE TOOLS

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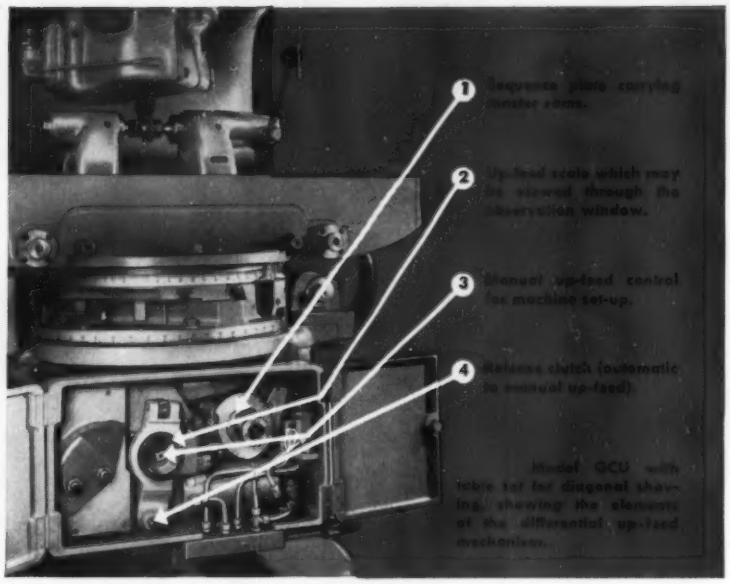
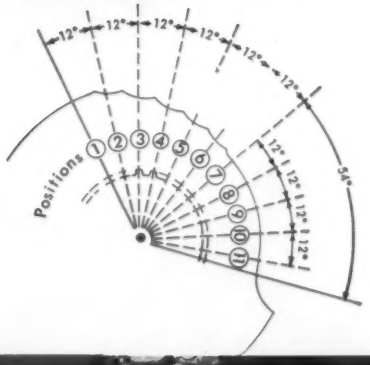


When Automatic Differential Up-feed and Conventional Crowning were added to the Red Ring Model GCU, shaving speed, flexibility and economy were all significantly increased.

AUTOMATIC DIFFERENTIAL UP-FEED

This efficient device provides for the first time an automatic cycle applicable to both diagonal and conventional shaving. This cycle is controlled by an eleven-position master cam. Included are backlash take-up, infeed cutting strokes, idling strokes and return to unloading backlash. The entire cycle or any portion of it may be used depending on job requirements.

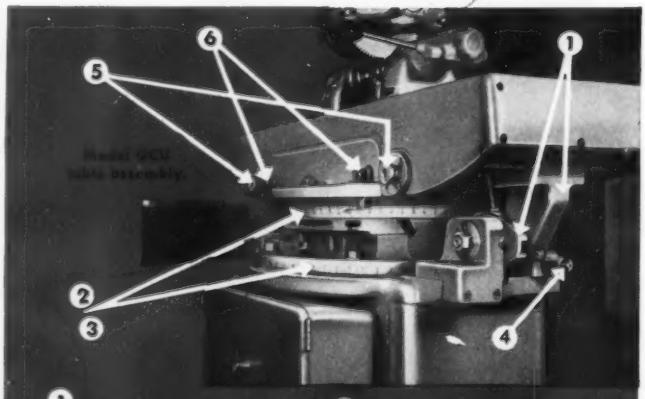
The cam itself does not actuate knee movement. It is strictly a stepped gaging device. Consequently every knee movement is positive, extremely precise and very fast. No danger of operator's errors. Perfect accessibility for fast loading and unloading.



One of the two control cams carried by the feed unit sequence plate.

CROWNING

Gears being shaved conventionally can be crowned by rocking the table about a central pivot during the automatic cycle. The cam controlling the rocking movement is located on table centerline to avoid any tendency to twist. This device also provides for taper shaving.



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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Limits and Fits for Cylindrical Parts... IV

This proposal for an American Standard will be published by the American Society of Mechanical Engineers after acceptance

table 4 (Continued) . . . Clearance Locational Fits

Limits are in thousandths of an inch.
Limits for hole and shaft are applied algebraically to the basic size to obtain the limits of size for the parts.
Data in bold face are in accordance with ABC agreements.

Nominal Size Range Inches		Class LC 1			Class LC 2			Class LC 3			Class LC 4			Class LC 5		
		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits	
Over	To		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft
0.04–	0.12	0 0.45	+ 0.25 − 0	+ 0 −0.2	0 0.65	+ 0.4 − 0	+ 0 − 0.25	0 1	+ 0.6 − 0	+ 0 − 0.4	0 2.0	+ 1.0 − 0	+ 0 − 1.0	0.1 0.75	+ 0.4 − 0	− 0.1 − 0.35
0.12–	0.24	0 0.5	+ 0.3 − 0	+ 0 −0.2	0 0.8	+ 0.5 − 0	+ 0 − 0.3	0 1.2	+ 0.7 − 0	+ 0 − 0.5	0 2.4	+ 1.2 − 0	+ 0 − 1.2	0.15 0.95	+ 0.5 − 0	− 0.15 − 0.45
0.24–	0.40	0 0.65	+ 0.4 − 0	+ 0 −0.25	0 1.0	+ 0.6 − 0	+ 0 − 0.4	0 1.5	+ 0.9 − 0	+ 0 − 0.6	0 2.8	+ 1.4 − 0	+ 0 − 1.4	0.2 1.2	+ 0.6 − 0	− 0.2 − 0.6
0.40–	0.71	0 0.7	+ 0.4 − 0	+ 0 −0.3	0 1.1	+ 0.7 − 0	+ 0 − 0.4	0 1.7	+ 1.0 − 0	+ 0 − 0.7	0 3.2	+ 1.6 − 0	+ 0 − 1.6	0.25 1.35	+ 0.7 − 0	− 0.25 − 0.65
0.71–	1.19	0 0.9	+ 0.5 − 0	+ 0 −0.4	0 1.3	+ 0.8 − 0	+ 0 − 0.5	0 2	+ 1.2 − 0	+ 0 − 0.8	0 4	+ 2.0 − 0	+ 0 − 2.0	0.3 1.6	+ 0.8 − 0	− 0.3 − 0.8
1.19–	1.97	0 1.0	+ 0.6 − 0	+ 0 −0.4	0 1.6	+ 1.0 − 0	+ 0 − 0.6	0 2.6	+ 1.6 − 0	+ 0 − 1	0 5	+ 2.5 − 0	+ 0 − 2.5	0.4 2.0	+ 1.0 − 0	− 0.4 − 1.0
1.97–	3.15	0 1.2	+ 0.7 − 0	+ 0 −0.5	0 1.9	+ 1.2 − 0	+ 0 − 0.7	0 3	+ 1.8 − 0	+ 0 − 1.2	0 6	+ 3 − 0	+ 0 − 3	0.4 2.3	+ 1.2 − 0	− 0.4 − 1.1
3.15–	4.73	0 1.5	+ 0.9 − 0	+ 0 −0.6	0 2.3	+ 1.4 − 0	+ 0 − 0.9	0 3.6	+ 2.2 − 0	+ 0 − 1.4	0 7	+ 3.5 − 0	+ 0 − 3.5	0.5 2.8	+ 1.4 − 0	− 0.5 − 1.4
4.73–	7.09	0 1.7	+ 1.0 − 0	+ 0 −0.7	0 2.6	+ 1.6 − 0	+ 0 − 1.0	0 4.1	+ 2.5 − 0	+ 0 − 1.6	0 8	+ 4 − 0	+ 0 − 4	0.6 3.2	+ 1.6 − 0	− 0.6 − 1.6
7.09–	9.85	0 2.0	+ 1.2 − 0	+ 0 −0.8	0 3.0	+ 1.8 − 0	+ 0 − 1.2	0 4.6	+ 2.8 − 0	+ 0 − 1.8	0 9	+ 4.5 − 0	+ 0 − 4.5	0.6 3.6	+ 1.8 − 0	− 0.6 − 1.8
9.85–	12.41	0 2.1	+ 1.2 − 0	+ 0 −0.9	0 3.2	+ 2.0 − 0	+ 0 − 1.2	0 5	+ 3.0 − 0	+ 0 − 2.0	0 10	+ 5 − 0	+ 0 − 5	0.7 3.9	+ 2.0 − 0	− 0.7 − 1.9
12.41–	15.75	0 2.4	+ 1.4 − 0	+ 0 −1.0	0 3.6	+ 2.2 − 0	+ 0 − 1.4	0 5.7	+ 3.5 − 0	+ 0 − 2.2	0 12	+ 6 − 0	+ 0 − 6	0.7 4.3	+ 2.2 − 0	− 0.7 − 2.1
15.75–	19.69	0 2.6	+ 1.6 − 0	+ 0 −1.0	0 4.1	+ 2.5 − 0	+ 0 − 1.6	0 6.5	+ 4 − 0	+ 0 − 2.5	0 12	+ 6 − 0	+ 0 − 6	0.8 4.9	+ 2.5 − 0	− 0.8 − 2.4
19.69–	30.09	0 3.2	+ 2.0 − 0	+ 0 −1.2	0 5.0	+ 3 − 0	+ 0 − 2	0 8	+ 5 − 0	+ 0 − 3	0 16	+ 8 − 0	+ 0 − 8	0.9 5.9	+ 3.0 − 0	− 0.9 − 2.9
30.09–	41.49	0 4.1	+ 2.5 − 0	+ 0 −1.6	0 6.5	+ 4 − 0	+ 0 − 2.5	0 10	+ 6 − 0	+ 0 − 4	0 20	+10 − 0	+ 0 −10	1.0 7.5	+ 4.0 − 0	− 1.0 − 3.5
41.49–	56.19	0 5.0	+ 3.0 − 0	+ 0 −2.0	0 8.0	+ 5 − 0	+ 0 − 3	0 13	+ 8 − 0	+ 0 − 5	0 24	+12 − 0	+ 0 −12	1.2 9.2	+ 5.0 − 0	− 1.2 − 4.2
56.19–	76.39	0 6.5	+ 4.0 − 0	+ 0 −2.5	0 10	+ 6 − 0	+ 0 − 4	0 16	+10 − 0	+ 0 − 6	0 32	+16 − 0	+ 0 −16	1.2 11.2	+ 6.0 − 0	− 1.2 − 5.2
76.39–	100.9	0 8.0	+ 5.0 − 0	+ 0 −3.0	0 13	+ 8 − 0	+ 0 − 5	0 20	+12 − 0	+ 0 − 8	0 40	+20 − 0	+ 0 −20	1.4 14.4	+ 8.0 − 0	− 1.4 − 6.4
100.9–	131.9	0 10.0	+ 6.0 − 0	+ 0 −4.0	0 16	+10 − 0	+ 0 − 6	0 26	+16 − 0	+ 0 −10	0 50	+25 − 0	+ 0 −25	1.6 17.6	+10.0 − 0	− 1.6 − 7.6
131.9–	171.9	0 13.0	+ 8.0 − 0	+ 0 −5.0	0 20	+12 − 0	+ 0 − 8	0 32	+20 − 0	+ 0 −12	0 60	+30 − 0	+ 0 −30	1.8 21.8	+12.0 − 0	− 1.8 − 9.8
171.9–	200	0 16.0	+10.0 − 0	+ 0 −6.0	0 26	+16 − 0	+ 0 −10	0 41	+25 − 0	+ 0 −16	0 80	+40 − 0	+ 0 −40	1.8 27.8	+16.0 − 0	− 1.8 −11.8

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Provide accurate, pre-set end pressures for every need!

Why waste toolmaker's time machining make-shift devices to provide necessary spring loads? Standardizing on low-cost, ready-made Vlier Spring Plungers speeds jig and fixture manufacture and insures *accurate, uniform* loading, resulting in more accurate machining, fewer rejected parts!

40 TYPES AND SIZES! Hundreds of thousands of Vlier Spring Plungers are now in use positioning parts in dies, jigs, and fixtures, as detents, locating pins, and die ejectors... wherever accurately-controlled, constant spring pressure is needed! *Order a wide assortment of types and sizes from your Vlier distributor today!*

1. **Plunger end telescopes completely within body!** End pressure is determined with plunger end telescoped 50%.
2. **Case-hardened plunger end gives high wear resistance!** Ductile core overcomes brittleness, reduces hazard of failure under impact common with hardened, high-carbon steel.

3. **Large bearing surface** assures perfect alignment at any part of plunger travel; eliminates binding and reduces wear!
4. **Rust-proof finish** prevents freezing in the fixture!

4 Nose Types Available!

Standard Nose—Cylindrical plunger end is accurately radiused to speed loading and unloading of jig or fixture. End pressures available from 3# to 42#, various diameters and lengths.

Silvernose—Cadmium-plated plunger ends identify light (1# to 7#) end pressures. Special spring design developed for fast, repetitive operations; give millions of flexes without fatigue failure!

Hexnose—Plunger end is hexagonal-shaped. Can be easily and quickly installed, adjusted, or removed with an ordinary end wrench! End pressures available from 8# to 12# in Standard type, and from 2½# to 6# in Silvernose type; various diameters and lengths.

Plastic Nose—For use with aluminum, brass, and other soft, easily marred materials. Plastic plunger end reinforced for less deformation under loading. Excellent wear resistance; high dielectric strength. End pressures available from 5# to 18# in Standard type, and 1½# to 7# in Silvernose type; various diameters and lengths.

VLIER ENGINEERING

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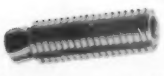

Vlier Screw-ball Clamps — Overcome angular irregularities in clamping set-ups. Prevent surface damage. 17 sizes!

Vlier Key Klips—Eliminate lost hex keys! Speed positioning of part in fixture. 3 sizes!

Vlier Torque Thumb Screws—Apply accurate, controlled end pressures to the workpiece. 4 models; 19 sizes!

Vlier Spring Stops—For use where there are no wall sections in fixture. Two models: 14 and 32 lbs. end pressure.

Vlier Toggle Pads—Assure clamping of parts with irregular surfaces. 5 sizes: for use with standard screws, toggle clamps and pliers.

Vlier Fixture Keys—New 5-Way Key fits all common mill table slots. 3-Way model also available.

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Limits and Fits for Cylindrical Parts... V

table 4 (Continued) . . . Clearance Locational Fits

Limits are in thousandths of an inch.
Limits for hole and shaft are applied algebraically to the basic size to obtain the limits of size for the parts.
Data in bold face are in accordance with ABC agreements.

Nominal Size Range Inches		Class LC 6			Class LC 7			Class LC 8			Class LC 9			Class LC 10			Class LC 11		
		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits	
Over	To		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft
0.04–	0.12	0.3	+ 0.6	– 0.3	0.6	+1.0	–0.6	1.0	+1.6	– 1.0	2.5	+2.5	–2.5	4	+ 4	– 4	5	+ 6	– 5
		1.5	– 0	– 0.9	2.6	– 0	–1.6	2.0	– 0	– 2.0	7.5	– 0	–5.0	12	– 0	– 8	17	– 0	– 11
0.12–	0.24	0.4	+ 0.7	– 0.4	0.8	+1.2	–0.8	1.2	+1.8	– 1.2	2.8	+3.0	–2.8	4.5	+ 5	–4.5	6	+ 7	– 6
		1.8	– 0	– 1.1	3.2	– 0	–2.0	4.2	– 0	– 2.4	8.8	– 0	–5.8	14.5	– 0	–9.5	20	– 0	– 13
0.24–	0.40	0.5	+ 0.9	– 0.5	1.0	+1.4	–1.0	1.6	+2.2	– 1.6	3.0	+3.5	–3.0	5	+ 6	– 5	7	+ 9	– 7
		2.3	– 0	– 1.4	3.8	– 0	–2.4	5.2	– 0	– 3.0	10.0	– 0	–6.5	17	– 0	– 11	25	– 0	– 16
0.40–	0.71	0.6	+ 1.0	– 0.6	1.2	+1.6	–1.2	2.0	+2.8	– 2.0	3.5	+4.0	–3.5	6	+ 7	– 6	8	+ 10	– 8
		2.6	– 0	– 1.6	4.4	– 0	–2.8	6.4	– 0	– 3.6	11.5	– 0	–7.5	20	– 0	– 13	28	– 0	– 18
0.71–	1.19	0.8	+ 1.2	– 0.8	1.6	+2.0	–1.6	2.5	+3.5	– 2.5	4.5	+5.0	–4.5	7	+ 8	– 7	10	+ 12	– 10
		3.2	– 0	– 2.0	5.6	– 0	–3.6	8.0	– 0	– 4.5	14.5	– 0	–9.5	23	– 0	– 15	34	– 0	– 22
1.19–	1.97	1.0	+ 1.6	– 1.0	2.0	+2.5	–2.0	3.6	+4.0	– 3.0	5	+6	– 5	8	+ 10	– 8	12	+ 16	– 12
		4.2	– 0	– 2.6	7.0	– 0	–4.5	9.5	– 0	– 5.5	17	– 0	– 11	28	– 0	– 18	44	– 0	– 28
1.97–	3.15	1.2	+ 1.8	– 1.0	2.5	+3.0	–2.5	4.0	+4.5	– 4.0	6	+7	– 6	10	+ 12	– 10	14	+ 18	– 14
		4.8	– 0	– 3.0	8.5	– 0	–5.5	11.5	– 0	– 7.0	20	– 0	– 13	34	– 0	– 22	50	– 0	– 32
3.15–	4.73	1.4	+ 2.2	– 1.4	3.0	+3.5	–3.0	5.0	+5.0	– 5.0	7	+9	– 7	11	+ 14	– 11	16	+ 22	– 16
		5.8	– 0	– 3.6	10.0	– 0	–6.5	13.5	– 0	– 8.5	25	– 0	– 16	39	– 0	– 25	60	– 0	– 38
4.73–	7.09	1.6	+ 2.5	– 1.6	3.5	+4.0	–3.5	6	+6	– 6	8	+10	– 8	12	+ 16	– 12	18	+ 25	– 18
		6.6	– 0	– 4.1	11.5	– 0	–7.5	16	– 0	–10	28	– 0	– 18	44	– 0	– 28	68	– 0	– 43
7.09–	9.85	2.0	+ 2.8	– 2.0	4.0	+4.5	–4.0	7	+7	– 7	10	+12	– 10	16	+ 18	– 16	22	+ 28	– 22
		7.6	– 0	– 4.8	13.0	– 0	–8.5	18.5	– 0	–11.5	34	– 0	– 22	52	– 0	– 34	78	– 0	– 50
9.85–	12.41	2.2	+ 3.0	– 2.2	4.5	+5.0	–4.5	7	+8	– 7	12	+12	– 12	20	+ 20	– 20	28	+ 30	– 28
		8.2	– 0	– 5.2	14.5	– 0	–9.5	20	– 0	–12	36	– 0	– 24	60	– 0	– 40	88	– 0	– 58
12.41–	15.75	2.5	+ 3.5	– 2.5	5	+6	– 5	8	+9	– 8	14	+14	– 14	22	+ 22	– 22	30	+ 35	– 30
		9.5	– 0	– 6.0	17	– 0	–11	23	– 0	–14	42	– 0	– 28	66	– 0	– 44	100	– 0	– 65
15.75–	19.69	2.8	+ 4.0	– 2.8	5	+6	– 5	9	+10	– 9	16	+16	– 16	25	+ 25	– 25	35	+ 40	– 35
		10.8	– 0	– 6.8	17	– 0	–11	25	– 0	–15	48	– 0	– 32	75	– 0	– 50	115	– 0	– 75
19.69–	30.09	3.0	+ 5.0	– 3.0	6	+8	– 6	10	+12	–10	18	+20	– 18	28	+ 30	– 28	40	+ 50	– 40
		13.0	– 0	– 8.0	22	– 0	–14	20	– 0	–18	58	– 0	– 38	88	– 0	– 58	140	– 0	– 90
30.09–	41.49	3.5	+ 6.0	– 3.5	7	+10	– 7	12	+16	–12	20	+25	– 20	30	+ 40	– 30	45	+ 60	– 45
		15.5	– 0	– 9.5	27	– 0	–17	38	– 0	–22	70	– 0	– 45	110	– 0	– 70	165	– 0	–105
41.49–	56.19	4.0	+ 8.0	– 4.0	8	+12	– 8	14	+20	–14	25	+30	– 25	40	+ 50	– 40	60	+ 80	– 60
		20.0	– 0	–12.0	32	– 0	–20	46	– 0	–26	85	– 0	– 55	140	– 0	– 90	220	– 0	–140
56.19–	76.39	4.5	+10.0	– 4.5	9	+16	– 9	16	+25	–16	30	+40	– 30	50	+ 60	– 50	70	+100	– 70
		24.5	– 0	–14.5	41	– 0	–25	57	– 0	–32	110	– 0	– 70	170	– 0	–110	270	– 0	–170
76.39–	100.9	5	+12	– 5	10	+20	–10	18	+30	–18	35	+50	– 35	50	+ 80	– 50	80	+125	– 80
		29	– 0	–17	50	– 0	–30	68	– 0	–38	135	– 0	– 85	210	– 0	–130	330	– 0	–205
100.9–	131.9	6	+16	– 6	12	+25	–12	20	+40	–20	40	+60	– 40	60	+100	– 60	90	+160	– 90
		38	– 0	–22	62	– 0	–27	85	– 0	–45	160	– 0	–100	260	– 0	–160	410	– 0	–250
131.9–	171.9	7	+20	– 7	14	+30	–14	25	+50	–25	50	+80	– 50	80	+125	– 80	100	+200	–100
		47	– 0	–27	74	– 0	–44	105	– 0	–55	210	– 0	–130	330	– 0	–205	500	– 0	–300
171.9–	200	7	+25	– 7	14	+40	–14	25	+60	–25	50	+100	– 50	90	+160	– 90	125	+250	–125
		57	– 0	–32	94	– 0	–54	125	– 0	–65	250	– 0	–150	410	– 0	–250	625	– 0	–375

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DEPOSITS BUILT UP inside system from dust, sludge, varnish or other contaminants. Comparatively tight system.	**SUNVIS H.D. 700**	The cleansing action of Sunvis H.D. 700 removes deposits, eliminates costly tear-downs for cleaning.
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No one oil can give greatest economy in *all* hydraulic systems. As this chart points out, the condition of the system must be considered. To make sure that the oil you select will give the maximum economy in your particular system, have a talk with your Sun Oil Company representative. Or write Department AM-8.

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Limits and Fits for Cylindrical Parts... VI

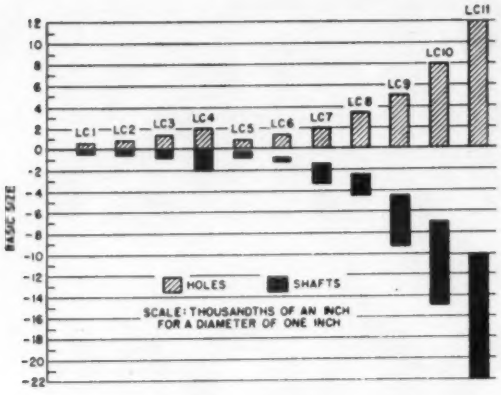

FIG. 2 . . . Graphical representation of standard-clearance locational fits shown in Table 4

Continued from July 19 *AM*. Further instructions to be published in succeeding issues.

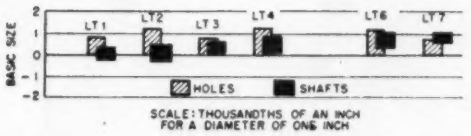

FIG. 3 . . . Graphical representation of standard transitional fits shown in Table 5

table 5 . . . Transition Locational Fits

Limits are in thousandths of an inch.

Limits for hole and shaft are applied algebraically to the basic size to obtain the limits of size for the mating parts.

Data in bold face are in accordance with ABC agreements.

"Fit" represents the maximum interference (minus values) and the maximum clearance (plus values).

Nominal Size Range Inches		Class LT 1			Class LT 2			Class LT 3			Class LT 4			Class LT 6			Class LT 7		
		Fit	Standard Limits		Fit	Standard Limits		Fit	Standard Limits		Fit	Standard Limits		Fit	Standard Limits		Fit	Standard Limits	
Over	To		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft
0.04	0.12	−0.15	+0.4	+0.15	−0.3	+0.6	+0.3							−0.55	+0.6	+0.55	−0.5	+0.4	+0.5
		+0.5	− 0	−0.1	+0.7	− 0	−0.1							+0.45	− 0	+0.15	+0.15	− 0	+0.25
0.12	0.24	−0.2	+0.5	+0.2	−0.4	+0.7	+0.4							−0.7	+0.7	+0.7	−0.6	+0.5	+0.6
		+0.6	− 0	−0.1	+0.8	− 0	−0.1							+0.5	− 0	+0.2	+0.2	− 0	+0.3
0.24	0.40	−0.3	+0.6	+0.3	−0.4	+0.9	+0.4	−0.5	+0.6	+0.5	−0.7	+0.9	+0.7	−0.8	+0.9	+0.8	−0.8	+0.6	+0.8
		+0.7	− 0	−0.1	+1.1	− 0	−0.2	+0.5	− 0	+0.1	+0.8	− 0	+0.1	+0.7	− 0	+0.2	+0.2	− 0	+0.4
0.40	0.71	−0.3	+0.7	+0.3	−0.5	+1.0	+0.5	−0.5	+0.7	+0.5	−0.8	+1.0	+0.8	−1.0	+1.0	+1.0	−0.9	+0.7	+0.9
		+0.8	− 0	−0.1	+1.2	− 0	−0.2	+0.6	− 0	+0.1	+0.9	− 0	+0.1	+0.7	− 0	+0.3	+0.2	− 0	+0.5
0.71	1.19	−0.3	+0.8	+0.3	−0.5	+1.2	+0.5	−0.6	+0.8	+0.6	−0.9	+1.2	+0.9	−1.1	+1.2	+1.1	−1.1	+0.8	+1.1
		+1.0	− 0	−0.2	+1.5	− 0	−0.3	+0.7	− 0	+0.1	+1.1	− 0	+0.1	+0.9	− 0	+0.3	+0.2	− 0	+0.6
1.19	1.97	−0.4	+1.0	+0.4	−0.6	+1.6	+0.6	+0.7	+1.0	+0.7	−1.1	+1.6	+1.1	−1.4	+1.6	+1.4	−1.3	+1.0	+1.3
		+1.2	− 0	−0.2	+2.0	− 0	−0.4	+0.9	− 0	+0.1	+1.5	− 0	+0.1	+1.2	− 0	+0.4	+0.3	− 0	+0.7
1.97	3.15	−0.4	+1.2	+0.4	−0.7	+1.8	+0.7	−0.8	+1.2	+0.8	−1.3	+1.8	+1.3	−1.7	+1.8	+1.7	−1.5	+1.2	+1.5
		+1.5	− 0	−0.3	+2.3	− 0	−0.5	+1.1	− 0	+0.1	+1.7	− 0	+0.1	+1.3	− 0	+0.5	+0.4	− 0	+0.8
3.15	4.73	−0.5	+1.4	+0.5	−0.8	+2.2	+0.8	−1.0	+1.4	+1.0	−1.5	+2.2	+1.5	−1.9	+2.2	+1.9	−1.9	+1.4	+1.9
		+1.8	− 0	−0.4	+2.8	− 0	−0.6	+1.3	− 0	+0.1	+2.1	− 0	+0.1	+1.7	− 0	+0.5	+0.4	− 0	+1.0
4.73	7.09	−0.6	+1.6	+0.6	−0.9	+2.5	+0.9	−1.1	+1.6	+1.1	−1.7	+2.5	+1.7	+2.2	+2.5	+2.2	−2.2	+1.6	+2.2
		+2.0	− 0	−0.4	+3.2	− 0	−0.7	+1.5	− 0	+0.1	+2.4	− 0	+0.1	+1.9	− 0	+0.6	+0.4	− 0	+1.2
7.09	9.85	−0.7	+1.8	+0.7	−1.0	+2.8	+1.0	−1.4	+1.8	+1.4	−2.0	+2.8	+2.0	−2.4	+2.8	+2.4	−2.6	+1.8	+2.6
		+2.3	− 0	−0.5	+3.6	− 0	−0.8	+1.6	− 0	+0.2	+2.6	− 0	+0.2	+2.2	− 0	+0.6	+0.4	− 0	+1.4
9.85	12.41	−0.7	+2.0	+0.7	−1.0	+3.0	+1.0	−1.4	+2.0	+1.4	−2.2	+3.0	+2.2	−2.8	+3.0	+2.8	−2.6	+2.0	+2.6
		+2.6	− 0	−0.6	+4.0	− 0	−1.0	+1.8	− 0	+0.2	+2.8	− 0	+0.2	+2.2	− 0	+0.8	+0.6	− 0	+1.4
12.41	15.75	−0.7	+2.2	+0.7	−1.0	+3.5	+1.2	−1.6	+2.2	+1.6	−2.4	+3.5	+2.4	−3.0	+3.5	+3.0	−3.0	+2.2	+3.0
		+2.9	− 0	−0.7	+4.7	− 0	−1.0	+2.0	− 0	+0.2	+3.3	− 0	+0.2	+2.7	− 0	+0.8	+0.6	− 0	+1.6
15.75	19.69	−0.8	+2.5	+0.8	−1.3	+4.0	+1.3	−1.8	+2.5	+1.8	−2.7	+4.0	+2.7	−3.4	+4.0	+3.4	−3.4	+2.5	+3.4
		+3.2	− 0	−0.7	+5.2	− 0	−1.2	+2.3	− 0	+0.2	+3.8	− 0	+0.2	+3.1	− 0	+0.9	+0.7	− 0	+1.8

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Talking Shop . . .

Home-Made Process Control

A LATHE OPERATOR in a small-lot shop was put on incentive wages a few months ago, and for a while he was earning at about the average 25% bonus. Then one day his earnings began to rise steadily until, on some jobs, he was making 75 or 80% bonus. Nobody could figure out what had happened, because the rates checked out OK.

Finally, one day a methods engineer happened to be talking with the operator when the foreman came over with an order for one piece. As soon as the foreman went away, the operator went to a big barrel near his machine, began poking around in it, and fished out a workpiece that filled the new order, remarking, "That's another 30 Standard Minutes."

The engineer, curious, asked what the man was doing. "Oh," he said, "that order comes through every couple of weeks. Last time the machine was set up for it I ran off a couple of extras after I clocked out on the job. So now I get paid for setup on this piece!"

Teamwork Gets Business

KAYDON ENGRG CORP, Muskegon, Mich, had a chance to bid on a $1¼-million aircraft-bearing order last spring, but figured the bid would have to be below current prices. The job would provide a year's work for 100 men of the 500 on the payroll and was the only big job in sight. Further, it was for a roller bearing for jets that the company had made before. So the company went to the union (Local 670, IAM) and explained, offering to provide $300,000 in new equipment and asking help. Permissible labor and material costs were figured "in reverse" by time study and estimating departments, new equipment and tooling planned. Then union officials studied the layout and suggested changes. These were made, and a review indicated that increased efficiency and lower scrap losses would give employees the same income as well as stable employment. The bid was made, the job obtained, and it is now in full production, as a result of cooperative effort. Kaydon has, incidentally, had no labor-caused work stoppages in its 13 years.

Variances

THE "EXCEPTION" PRINCIPLE—whereby management concerns itself only with variations from a norm—in one modern version for job shops deals with "variances." Any variation over 2 or 3% from base cost is at once reported to the front office on a "variance slip"—job times closer than that are not posted. This reduces paper work for the posting group and permits the works manager or superintendent to concentrate on trouble. Underestimated job times are reported to the cost dept; extra cost for a new or inefficient operator is charged to the apprenticeship account; a tool or machine failure is studied for cause to prevent recurrence. Operators are on incentive, adjusted for design changes and for changes in feeding or materials-handling devices, so both ingenuity and soldiering are quickly detected.

Eye Roller

LATEST USE for Alnico magnets is to avoid non-tracking of a glass eye. A New York doctor puts magnets in both the good eye and the glass one, so they roll and move in sympathy. Or so we hear. . . . Another recent use for magnets is as hold-downs for steel parts to be welded in place.

Cooling Coke

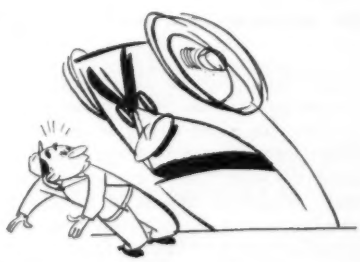
OLD-TIMER tells us of the case of the hard-to-machine piece that burned tool after tool. Finally, the operator, in disgust, shut off the regular coolant and poured on his bottle of "Coke." Cutting proceeded nicely with a good finish. In discussing the tale later with a cutting-fluids man, we find that its coolant properties are not overadvertised; it contains sugar, soda and some other elements very soothing to a raw steel surface.

Single Control

ONE JOB SHOP making bulky units controls production through a single record form with one line for each job. But that sheet has its peculiarities. Changes are listed daily, every foreman concerned has a copy, and at a weekly checkup meeting, each line is read and cross-checked in turn. This picks up failure to order stock or parts with necessary lead time, potentially overdue parts (on which an explanation must be provided at once), and the like. But its major function is to show everyone the status of all elements and to anticipate trouble, so shifts may be added, subcontracting done, or other steps taken. That avoids waste of assembly space on partially assembled units, spoilage from corrosion or damage in storage, as well as late delivery. Standard symbols are used to indicate even ordering of necessary material, part by part.

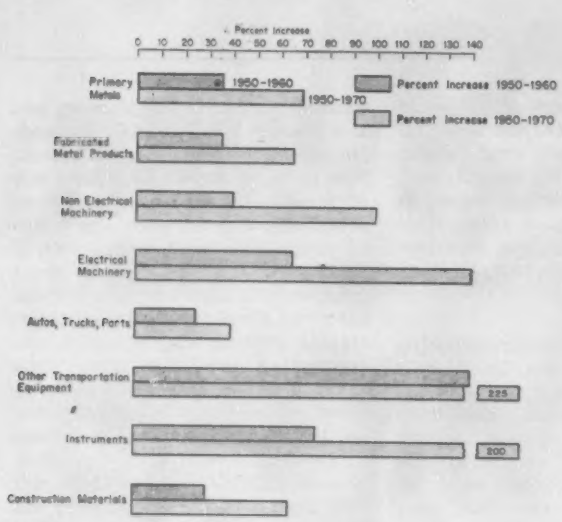
Cooperative Line

TWO YEARS AGO Mather Spring Co, Toledo, began a cost-reduction and modernization program cooperatively with its union, a CIO affiliate. While production per worker increased as a result of the program, the company's competitive position improved sufficiently so that now 25% more workers are employed than before. A major step is a 250-ft assembly line for springs which begins with elements and concludes with packaging. Control is from a central point by a two-way system.

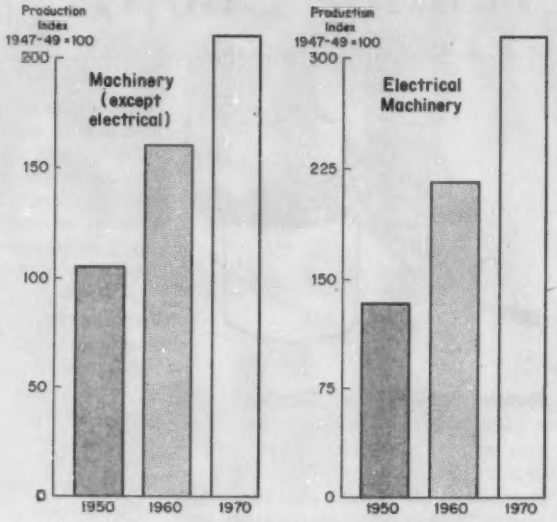


Machine-Shy

UNITED TOOL & DIE COMPANY, Hartford, Conn, recently assigned Anthony Danisewski, punch-press operator, to a 50-ton power press. He claimed to be "frightened" by it, refused to work at the machine. The company refused to assign him any other work, so he left his employment. Harold Strauch, Unemployment Compensation Commissioner for the First Congressional District, ruled July 1 that the "frightened" man was entitled to $13 a week in unemployment compensation, according to *The NY Times*.



HOW PRODUCTION WILL GROW IN DURABLE GOODS INDUSTRIES



HOW THE NEED FOR NEW MACHINERY WILL GROW BY 1970

METALWORKING'S LONG VIEW:

Needed—65% Expansion of US Industry to Meet

Every year there are 2-million more people in the United States. That means by 1970 there'll be close to 200-million Americans wanting goods and services. McGraw-Hill's new study tells you just what US industry will have to do to meet the demands of a mushrooming economy

NEW YORK—How big will the American market for goods and services be in the next two decades? What industries will grow fastest to meet the needs of a growing economy? Those are the questions asked and answered by a new McGraw-Hill Dept of Economics study of US long-range supply and demand.

150% of Today's Market in 1970

The US market of 1970 will be vastly different from today's. For one thing it will be almost half again as big as it is now. For another, improved technology and products will by 1970 have created new consumer demands.

Metalworking is among those industries that can look forward to an ever-brightening future. Others: plastics, materials handling, chemical and food processing, metal producing, electric power, electronics, transportation.

Here are some of the things the future holds for metalworking:

- A $32-billion-a-year capital goods market by 1960—$40 billion a year by 1970.
- Machinery output will increase more than one-third in the next two decades—electrical machinery almost 40%.
- A 150% increase in sales of industrial instruments and controls.
- A greatly expanded market for home appliances.
- Annual passenger car output of 7.5 million units by 1970.
- A vast new market for personal planes and helicopters.
- Spectacular growth in use of light metals and heat-resistant alloying elements.

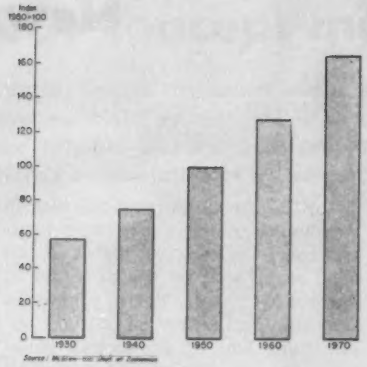
As it has in the past, Gross National Product of the future will depend upon the output-per-man-hour that our labor force can achieve. With the labor force growing from 65 million in 1953 to 82 million in 1970, the total market will grow in proportion.

From 1930 to 1950 output-per-man hour increased about 2% a year. Since then, because of technological improvements, it has grown even faster. It is expected productivity will increase 2.5% a year in the late '50's and '60's. If this growth is as expected, the result will be a Gross National Product of $415 billion in 1960, and $560 billion by 1970. This allows for a drop in the average workweek from 41 hrs in 1953 to 38 hrs in 1960, 35 hrs in 1970.

More Consumer Income

If, as we hope, defense needs are lower by then, there will be more real income for business and consumers. The greatest increase in production is likely to be in the consumer goods market.

What sort of materials and techniques will be needed to meet these expanding needs? Obviously, technology is changing for the better all the time, creating new products, even new industries. Proof? In the last five years, electronics output has increased 145%, plastics output is up 85%, aluminum products are up 100%. This means a whole series of new industrial revolutions in



HOW OUTPUT PER MAN HOUR WILL GROW BY 1970

1970's Market

the making—in metalworking, electronics and chemistry especially.

Plastics and synthetic products will replace wood, metal and natural fibers that are hard to process. The factory of tomorrow will be working to the greatest possible extent with plastics and fluid metals that can be molded or poured in continuous operations.

New Markets, New Techniques

Metalworking is already developing spectacular techniques to speed up operations—continuous casting of steel ingots, hot and cold extrusion, new casting and forging methods, to name just a few. Tomorrow's plant will get a wide variety of molded or extruded metal parts from continuous processes linked to primary metal production, with little direct labor involved. High-speed stamping and shearing operations will be linked up with steel rolling mills to process hot metal moving at 2000 fpm.

Within the plant, it may be expected that all materials will be handled automatically, with high-speed conveyor systems connecting almost all machines.

As machine tools operate at higher speeds, work will be fed to them from automatic conveyors controlled by electronics. Sometime before 1970, we may even see automatic assembly operations.

All these changes in technology will create a higher demand for capital goods. Manufacturing capacity will have to increase 65% by 1970 to keep pace with the market. Railroads and trucks must increase facilities to handle 80% more freight. The number of firms engaged in wholesaling and retailing may increase 150%. The result: needs for new capacity and replacement may result in as much as $32 billion a year in capital expenditures in 1960, over $40 billion a year by 1970. Top year to date: 1953—$28 billion.

33% Bigger Machinery Market

Machinery production, as measured by the American Machinist Index (p95) may reach 210 by 1970, compared with 144 today. Electrical machinery output may reach 315 on the American Machinist Index, compared with today's 131, and it is estimated electric generating equipment makers will be selling twice the volume they did in 1953.

Also strong in growth prospects in the next two decades are industrial instruments and controls (150% increase predicted), office machinery, chemical processing equipment, food processing and packaging machinery, commercial refrigeration equipment, mining machinery, oil field equipment, agricultural machinery, transportation, and because of ever-increasing plant mechanization, materials handling equipment.

A high rate of obsolescence will create large demand for new types of metalworking machinery (55% of US machine tools are 10 years or more old). This also holds true for foundry equipment and textile machinery.

15% More Metal Consumption

In the basic metalworking materials field, a 15% growth in consumption of steel, copper, lead and zinc is anticipated. There'll be more growth in alloy steel—perhaps 30%. And because of greater machine stress and heat, consumption of alloying elements such as columbium, molybdenum and the rare earth metals will increase.

But the really spectacular growth will be in light metals. Titanium output will increase several-fold. And the use of aluminum may double in 10 years, triple by 1970.

Plastics, too, will keep pace with industrial growth. Some future applications: pipes, dies, heavy bearings, auto body parts and housings for large appliances.

Consumer goods industries can look forward to a possible increase of 40% in per capita US income by 1970. In the durable goods field this will mean:

A greatly expanded market for electric appliances. The 1970 home will probably have (1) air conditioning, (2) electric heating, (3) more and more labor saving automatic appliances, (4) room-to-room color TV intercom systems.

Expanding Auto Market

The automobile market is still expanding, despite current talk of saturation. Growth factors include (1) increasing number of families, (2) trend toward two-car ownership, (3) possibility that most families will have two (winter and summer) homes by 1970 and a car in each one, (4) and more time for travel and recreation. The result is that by 1970, passenger car production is likely to reach 7.5 million units compared to 6.2 million in 1953.

And by 1970, there may be a substantial market for personal planes and helicopters. The auto industry is in a good position to enter this field, as well as the regular aircraft makers.

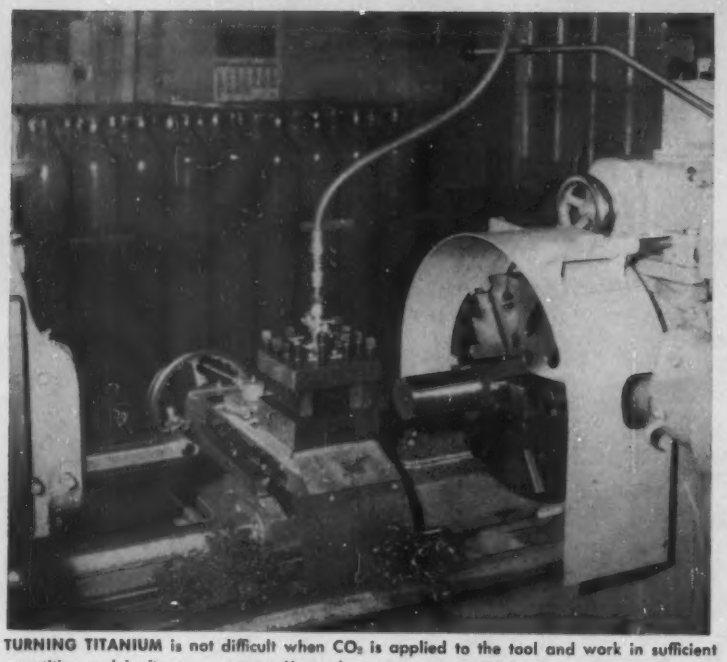
One thing is certain, no matter what the field, there is nothing automatic about the growth indicated by the McGraw-Hill study. If a company fails in its short-range planning, it may not survive long enough to worry about its long-range potentials.

FORD TO BUILD THIRD PROVING GROUND

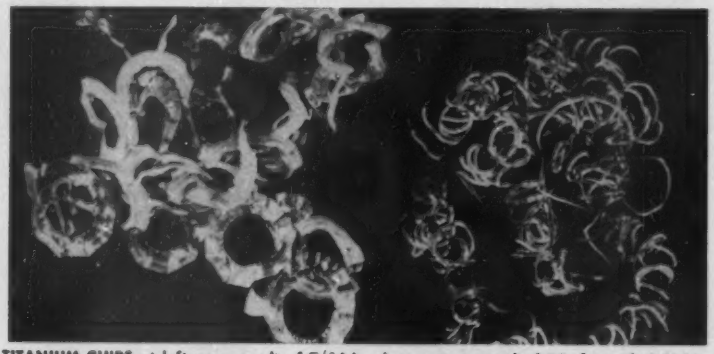
MACOMB COUNTY, MICH — Ford Motor Co has bought large parcels of farm land, totalling nearly 4000 acres, as the site of the company's third proving ground. This land, located here some 50 miles north of Detroit, added to a similar facility near Kingman, Ariz, and 400 acres in Detroit, will give Ford the largest proving ground facilities in the industry, according to company spokesmen.

Surveying of the Macomb County property will begin this summer, with construction scheduled to start next year, and operation slated to begin sometime early in 1956, Ford officials state.

News of Metalworking



TURNING TITANIUM is not difficult when CO_2 is applied to the tool and work in sufficient quantities and in its proper state. Heat absorption as a solid keeps work at room temperature, eliminates changes in structure



TITANIUM CHIPS at left were result of 7/16-in. deep cut at speed of 85 sfm with 0.004-ipr feed. Those at right were cut at 125 sfm. Material is Republic Steel's experimental grade RS-110-BX, forged and annealed, containing 3.5% Mg, 1.5 Al and 0.25 C. Finish on work was about 15 mu in., rms with Stellite J tool

TITANIUM FORGING SCALE is removed with ¾-in. deep cut at 100 sfpm and 0.004-ipr feed with resulting chips at left. Special cutoff tool produced free-curling chip at right with speed of 300 sfm, 0.004-ipr feed. Carbide tools were used in both cases

New

GEORGE H DeGROAT
associate editor

TOLEDO, Ohio—Current interest, in various titanium alloys and heat- and corrosion-resistant materials has been stimulated by the difficulty of machining them. Their properties are vitally important in military applications and, if production problems can be solved, the materials could be used economically in more widespread civilian uses. Numerous methods of machining them have been investigated with varying degrees of success; however, consistent accuracy and high production rates have not yet been reported. According to Paul E Brunberg, of CO_2 Development Company, conventional methods fail because:

HEAT AND COMPRESSION DURING CUT CHANGES STRUCTURE

Austenitic steels, which include stainless, Hastelloy, Multimet, chrome-nickel alloys, and others, tend to workharden and undergo structural changes during machining and forming. They become magnetic on the surface, grain structures are altered, segregation occurs, and they lose, to a considerable degree, the desirable properties that make them valuable. Some alloys of titanium are practically unmachinable under normal conditions because of seizing and galling, workhardening, and low-temperature oxidation.

These effects are caused principally by heat and compression during machining. Temperatures at the point of contact between the work and the tool have been measured to show 2000 F and over. This heat is conducted throughout the entire section as work progresses and causes the mass to expand in relation to its coefficient. As a result, dimensional accuracy is reduced by volumetric expansion and, more important, the expanded mass increases pressure against the tool, producing a burnishing effect while adding to the heat in the work caused by friction. In addition, the intensity of this heat may cause plastic deformation in the immediate cutting area.

CO_2 concept machines tough alloys

"Unmachinable" titanium alloys and heat-resistant materials are now machined by applying CO_2 not as a "coolant" but to maintain the original metallurgical properties of the material being cut. Here's a description of the new process and a recent demonstration

Metallurgical structure of the piece being machined changes at this temperature according to the characteristics of the metal and is usually quenched in this condition with water or oil. Conventional coolants conduct heat away from the point of contact, but do so too slowly to be effective with these materials. The importance of chemical and metallurgical properties in alloy steels, titanium, and other materials is obvious. A typical alloy may cost anywhere from $1 to $5 or more a pound and the user is paying for its special properties. If these are altered during machining, he not only loses what he paid for but it is possible that the changes may be detrimental to the finished part.

Of course, tools dull rapidly because high heat destroys their properties, too. Another important effect of the absorption of latent heat in the mass is the necessity of subsequent grinding. Usually there is one measurement at the machine and another at final inspection when the mass has returned to room temperature. Grinding is therefore required to maintain close tolerances.

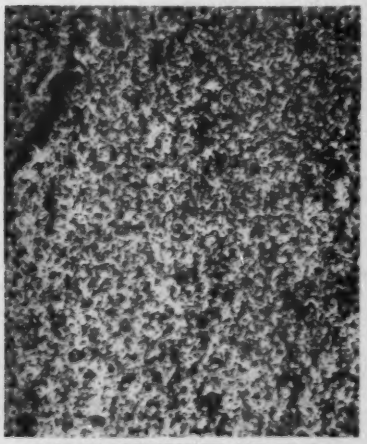
CO_2 KEEPS WORK AT ROOM TEMPERATURE

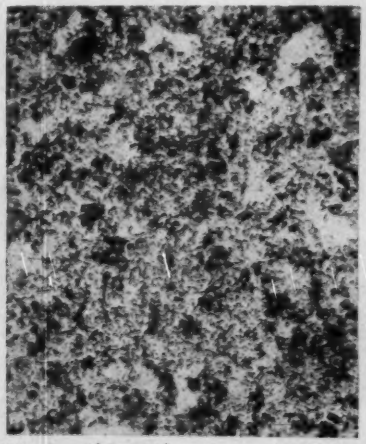
In the Accu-Tol process (patented by Mr Brunberg), a continuous, measured supply of liquid carbon dioxide is directed to the immediate area of contact between the tool and the work at a pressure of 750 to 900 psi. At this point, liquid CO_2 expands to deposit a measured quantity of solid CO_2 having a temperature of about –110 F (AM—Mar 3, '52, p129). Another change of state occurs as the solid CO_2 absorbs heat and sublimes. The amount of heat removed is indicated by the fact that solid CO_2 at –110 F and 14.7 psi sublimes by absorbing 246 Btu per lb.

Measurement of liquid CO_2 is critical, as is purity. Water vapor and other matter is extremely detrimental to the process. When the liquid leaves the jet to expand on the work and tool as a solid, a film of gas immediately appears in an infinitesimal layer between the metal and the solid CO_2. As a result, no freezing of the work or the tool can occur if an accurate amount of CO_2 is used. In practice, small, accurate, jets provide close control over the amount of CO_2 applied, thereby balancing the heat transferred in the operation with room temperature resulting at both the work and tool.

DEMONSTRATIONS PROVE THEORY BUT SHOW NEED FOR PURITY

Damaging effects of vapor lock were clearly, but unintentionally, demonstrated to representatives of major automobile, aircraft engine, appliance and machine-tool manufacturers on June 24. A temporary setup was installed in the Akron plant of National Cylinder Gas Company who cooperated with CO_2 Development Company by supplying CO_2 and acting as host for the demonstration. Vapor lock caused by temporary overhead lines prevented application of CO_2 to the tools and work so general results were poor compared with those obtained the next day when the lines were adjusted and the same work was performed on the material a second





EFFECT OF COMPRESSION AND HEAT in machining is evident in photomicrograph of SAE 8660 chip, left. This structural change must be avoided in the work, right, if full advantage is to be had from properties of alloy. Proper use of CO_2 permits machining this material at hardness of R_c50, keeps work at room temperature, eliminates metallurgical changes

ANNEALED MICROSTRUCTURE (1000X) of a typical titanium alloy shows alpha and beta phases and is typical of Ti alloy structures

Courtesy Republic Steel Corp

NEW CO_2 CONCEPT (Cont'd)

time. The condition induced a gaseous state which diluted the liquid to a point where it could not absorb heat at the rate required.

Among the materials machined was Republic Steel's forged and annealed experimental grade of titanium, RS110BX, containing 3.5% Mg, 1.5 Al and 0.25 C. Very hard, insoluble titanium carbide exists in the matrix of this material, which also has a surface contamination between 0.001 to 0.006 in. deep, making it extremely difficult to machine. As rigidity in the equipment employed for machining any of these materials is essential, a 2-A Warner-Swasey turret lath was set up.

First operation on the titanium bar, 3 in. in diameter, was to remove the scale with a ⅛-in.-deep cut using a carbide tool, Carboloy grade 370. Feed rate was 0.015 ipr and speed was 100 sfpm. Even under adverse conditions so far as delivery of CO_2 was concerned, the work remained at room temperature. A second cut 1/16 in. deep was then made with a feed of 0.006 ipr and a speed of 512 sfpm, this time using a Carboloy grade 883 tool. Again the work maintained room temperature. Slight edge buildup was evident in the tools in both cases, however.

CONDITIONS CORRECTED

Under corrected conditions when the proper form of CO_2 was applied, a 7/16-in.-deep cut was made in the same bar with a feed of 0.004 ipr and a speed of 75 sfpm, resulting in a mirror finish and no edge buildup or tool wear. In this case, the tool material was Haynes Stellite J. Also in the second demonstration, a 1/16-in.-deep cut was made in this material for a length of 6 in., resulting in a mirror finish and no wear on the Stellite tool. Here a speed of 125 sfpm was used with feed of 0.004 ipr.

Importance of the proper application of CO_2 was evident during the first demonstration when a parting operation was performed on the titanium bar. Normally this is one of the most difficult with any material because of the relationship of a deep cut with a narrow tool. In this instance, however, it was possible to direct plenty of CO_2 to the work and tool. A special "Manchester" cutoff tool, made by Portage Double Quick Tool Co, Akron, permitted jets to enter the parting groove as it was cut, thereby insuring a good supply of CO_2 where it was most effective. The tool contained a ¼-in.-wide Carboloy grade 370 insert held in a V-design support, and excellent results were obtained with various feeds and speeds. Cuts were made ½ in. deep and more rather than all the way through because the bar was solid and surface speeds drop to zero at the center of a bar unless it has previously been bored or drilled. First cut was made with a feed of 0.006 ipr at a speed of 298 sfpm, then shifted to 0.008-ipr feed and a speed of 417 sfm. The last cut was made at this same speed but with a feed of 0.011 ipr. In each case the bar stayed at room temperature and no tool wear was evident.

In contrast to this, a drilling operation was entirely unsuccessful because the setup did not permit proper application of the CO_2. Chips turned the jets aside, with resulting damage to the drill and workhardening of the material. Oil-hole drills through which CO_2 can be successfully applied were not available in this setup but were employed advantageously during the second demonstration. For example, a 5¼-in.-deep hole of 1¼-in. dia was easily produced in titanium at a speed of 600 sfpm, resulting in an excellent finish.

Republic Steel also supplied SAE 4340, high-strength aircraft alloy steel, with a hardness of approximately 500 Bhn. Usually the maximum hardness at which this alloy can be machined at all is around 340 Bhn where it has a tensile strength of about 150,000 psi. It was stated that the material could be far more useful if it were machinable at the higher hardness where its strength is about 200,000 psi.

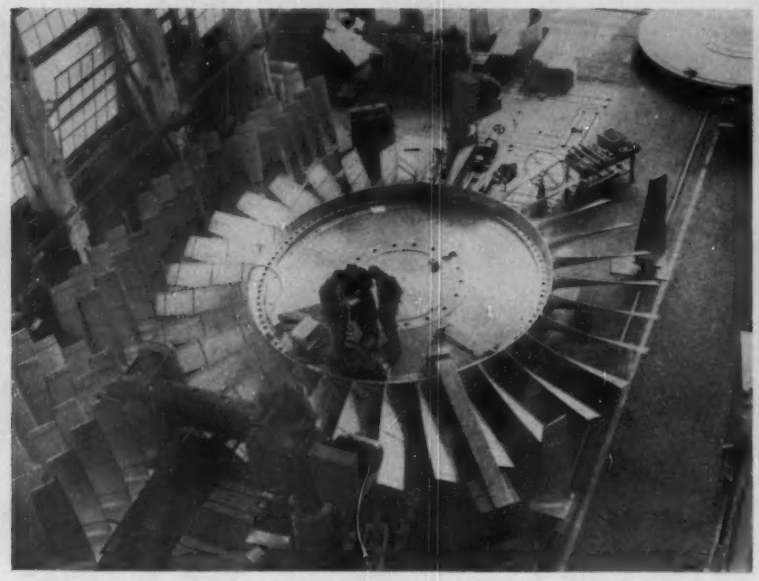
A rough-turning operation was performed to remove scale at a speed of 112 sfm and a feed of 0.015 ipr. Depth of cut was 1/16 in. and, again, a Carboloy grade 370 tool was employed. With sufficient CO_2 applied to the tool and work, results were excellent. Cutoff operations were also performed on this material using the Manchester tool with 209-sfpm speed and a feed of 0.005 ipr as well as a lower speed, 85 sfpm and the same feed. No difficulty was encountered in either case.

Hastelloy X and Hastelloy C were also machined during these demonstrations. Compressive strength of Hastelloy X is estimated to be 200,000 psi and it is this great resistance to pressure of the cutting tool that presents the difficulty in machining it. Usually, casting must be resorted to for shaping these materials. General chemical analysis of Hastelloy X is 45.0 Ni, 22.0 Cr, 9.0 Mo, 0.15 C, and the balance iron. Hastelloy C contains 15.0 Cr, 15.0 Mo, 5.0 W, 5.0 Fe, 0.15 C max, and the balance nickel.

Cuts as deep as ⅛ in. and 5 in. long were made with Carboloy grade 883 tools. Speeds up to 732 sfpm were used with relatively light feeds, 0.004 and 0.006 ipr. Here again, the importance of CO_2 in its proper form, and in good quantities, was clearly demonstrated. Results were excellent when these conditions were met but tool breakdown was fast under adverse conditions. Another difficult material which was readily machined was 18-8 stainless. A cut 3/16 in. deep was made with 883 Carboloy at a speed of 400 sfpm and a feed of 0.035 ipr, resulting in a mirror finish and no tool wear.

COST OF PROCESS DEPENDS ON APPLICATION

The CO_2 installation for these demonstrations consisted of 3 banks of 20 cylinders each, the total CO_2 amounting to 1½ tons. Consumption was about 100 to 150 lb per hour at 900 psi, the high pressure providing a good expansion factor. Of course, the number of cylinders required for any particular setup may be as few as 2, 3 or 4 for a week's run, or more CO_2 may be required depending upon individual circumstances. Jets will consume as little as 9 lb of CO_2 per hour (0.009-in.-dia orifice) at a cost of approximately $0.05 per lb. Actually, the average cost for most operations may be considered to be $0.45 to $0.50 per hour. The general economic advantage of the process is gained from the speed by which difficult machining operations can be performed on tough materials. Usually production rates are increased by as much as three times that required for comparable work with conventional methods. Despite the fact that there is no means of reusing CO_2 and it must be considered expendable, higher production rates can justify its cost. In addition, it does not combine with reactive and costly materials, (titanium, for example) so greater chip salvage contributes to the economy of its use and, in many cases subsequent grinding operations are eliminated.



Blading and Balancing

PWT COMPRESSOR DISK FOR USAF'S PROPULSION WIND TUNNEL at Tullahoma, Tenn, is both bladed and balanced on fixture that mounts it horizontally. Holes in disk OD are drilled to take blades when disk is in fixture, too. It's part of the largest wind tunnel compressor physically possible to build at present; was built by Westinghouse Electric Corp

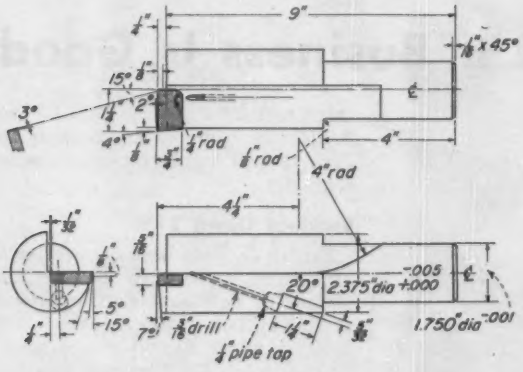
DERBYSHIRE BUYS STARK TOOL CO

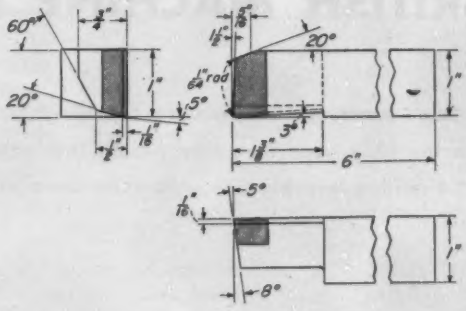
WALTHAM, MASS — Richard F Derbyshire, for the last 16 years president, treasurer and general manager of F W Derbyshire Inc of Waltham, has severed all connections with that organization and has purchased the Stark Tool Co of this city.

Consolidates Plants

Mr Derbyshire has taken one of F W Derbyshire's two plants here, including much of its personnel, and has consolidated it with Stark Tool Co's manufacturing operations. Stark Tool Co, in operation here since 1860 and said to be the originator of the American bench lathe, will continue to manufacture lathe units comparable in size and capacity to those of F W Derbyshire, plus attachments, collets and special tooling.

Stark will also continue to manufacture its Nos 2, 3½, 4 and 4½, and Series 400 bench lathes. In addition, the company will continue to manufacture and market the Stark line of tool room furnaces.





Turret lathe bores from solid...

. . . with turret tool incorporating a jet for soluble oil. This is essentially a flat-faced 2¾-in. gun drill, with the outer edge of the flat blade leading 2° to cut out the slug. The cutting edge, of KM4480 carbide or equivalent, has 7° cutting-edge rake and 5° side rake, with zero top rake. The central corner has 15° taper extending back ⅛ in. or more, to leave a center tit. It drilled NE8749 of 180 Bhn at 694 rpm (432.7 sfpm) and 0.007 ipr feed in a 7A J & L turret lathe

. . . with toolpost tool. Shown is the design for a tool to cut 1⅞-in. hole, but the same proportions were used on a tool to cut a 2½-in.-dia hole. Again the blade is flat, of KM 4480 or equivalent, with 5° front and side rake and zero top rake. The outer corner leads 1½°, and the inside corner is relieved at 20° for 5/16 in. back. It drilled C1141 at 212 Bhn at 1000 rpm (654.5 sfpm) and 0.007 ipr feed in a 7A turret lathe, with flooding of soluble oil

These two styles of turret-lathe drill were used in a recent demonstration at Jones & Lamson Machine Company on new 7A turret lathes, "punching" holes in 1 x 5¾-in. sections of billet.

OUTPUT LIMITED TO 150-200 A MONTH

STUTTGART — ZUFFENHAUSEN, GERMANY — Porsche Automobile Works here is turning out one of the few automobiles in the world today that is chiefly hand made. Because of the number of hand operations involved in manufacture of the Porsche sports car, production is limited to 150-200 cars a month. The two-seater Porsche differs from most automobiles in that the 40, 55 and 70 hp engines are in the rear, with the gas tank under the hood, and the body is of one piece construction. Proof of Porsche's pride of craftsmanship is shown in the photo at right, where the mechanic who assembles each motor takes full responsibility for the job, proudly chisels his name into the engine block in the same manner that the guild craftsmen of old identified their work with a hallmark.

Germany's Porsche Features a . . .

Small Output, High Craftsmanship

PORSCHE PLANT'S ONE ASSEMBLY LINE (left) turns out 150-200 of the rear-engined, one-piece-body two-seater sports cars a month

BRITISH MACHINE TOOLS: Business Is Good

Britain's machine tool industry reports a 21% gain in first quarter 1954 over the same period last year. One reason: $11.7 million in exports — with even more expected

NEW YORK — The British machine tool building industry booked $42.2 million of new orders during the first quarter of this year, a gain of 21% over the same quarter in 1953, R D G Ryder, president of the British Machine Tool Trades Association, revealed here recently, just before his return to England.

Export business, which amounted to $11.7 million in the first quarter, was chiefly responsible for the improvement. Australia continues to be Britain's best machine tool customer, Mr Ryder said. Canada, however, is a close second. South Africa, India, United States, France and Italy follow in the order named.

"Export is vital to our industry," he commented. "We intend to make every effort to maintain our foreign sales as near as possible to 40% of the total by seeking new markets and improving our position in markets already established.

"One means of doing this is by international exhibitions. Annual shows, on the other hand, are not in the best interests of the trade. The European Committee, by staging one large exhibition in each of the past three years, with another this year at Milan, Italy, has eliminated the showing at many national fairs. But there will be no further European Shows after this year until 1957."

Mr Ryder said that another machine tool show will be held by the British at Olympia in London in June 1956. It will be international in character.

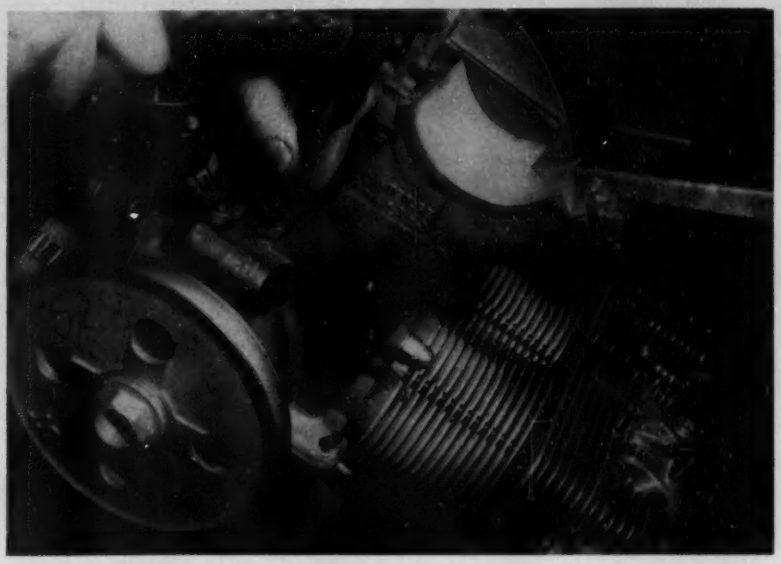
Backlogs Down 21%

British builders' backlogs are down 21% from a year ago, despite the pickup in new orders. They stood at $196 million on April 1, the latest date for which figures are at hand. Of that total, $53.2 million was for export customers, Mr Ryder disclosed.

Makers of large general-purpose machine tools and of high-production machines have not been affected by the shrinkage in volume. They are quoting 2-4 years' deliveries. The drop occurred mainly in general-purpose tools of the smaller and lighter types. They are available from stock or within 2-3 weeks.

The British industry produced $45.3 million of machine tools in the first quarter, Mr Ryder said. Some $12.8 million of this output will go to overseas customers.

One-Piece Body . . .



and Is Almost All Hand Made

Characterizes Germany's Rear-Engined Porsche . . .

BODY AND MAIN COMPONENTS: engine, rear axle, gear case, differential, wheels

FINAL PROOF OF CRAFTSMANSHIP comes when the mechanic who assembles the engine chisels his name into the motor block

But by Way of Contrast . . .

Volkswagen Turns Out 900 Cars a Day

ONCE A PRIME TARGET FOR ALLIED BOMBS DURING WORLD WAR II, this assembly line at the Volkswagen Auto Works in Wolfsburg, West Germany, is currently turning out nearly 900 automobiles a day. The plant, located in the British Zone, near the Soviet Sector, employs 22,000 workers, recently turned out its 500,000th Volkswagen automobile since the end of World War II

US MACHINE TOOL INSPECTION COMPLETED

WASHINGTON — Machine - tool industry committees have just completed a series of inspections of the Defense Dept's six largest machine tool storage sites, at Chicago, Omaha, Mechanicsburg, Penna; Charleston, W Va; Kings Mill, Ohio; and Marion, Ohio.

The committees checked (1) whether Washington inventory records jibe with military tools in storage, (2) whether the stored tools can still be used, (3) methods of receiving, dismantling, storing and preserving the idle tools, and (4) storage costs.

The inspections were made by teams made up of six industry men each — builders, dealers and users — to investigate charges that much of the idle equipment stored in military field warehouses was never reported to Washington for redistribution to contractors, and that storage costs were excessive.

To date, Washington has no comment on committee findings.

"Most Flexible Finance-Leasing Plan"

Straight rental or outright purchase of machine tools—and almost anything between—they're all included in Jones & Lamson Co's new marketing plan

SPRINGFIELD, VT—Jones & Lamson Machine Co, in conjunction with CIT Corp, is offering what it terms "the most flexible and complete financing and leasing plan in the machine-tool field."

Three Basic Plans

J & L is offering: (1) a lease plan without option-to-buy running up to nine years, (2) an installment-financing plan with five-year terms, (3) a lease with option-to-buy at a stated price at the end of any year. The latter plan, in the opinion of J & L President Hardage L Andrews "is an arrangement under which the rental is not deductible for income tax purposes."

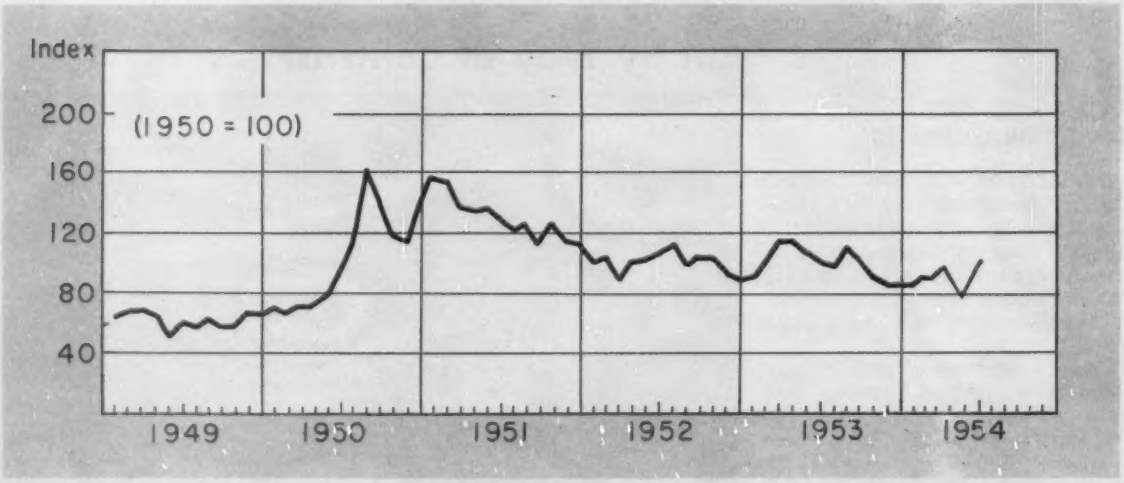
Four lease plans-without-purchase-options are available to Jones & Lamson customers. The principal difference between them is in the annual rental and return charges. A 10% deposit is required with each plan, the deposit being refunded to the customer at contract's end.

Under these four plans, the user can make an offer at any time to buy at a fair market value. There is no obligation however, on the part of the user to buy, and there is no agreement by J & L to sell. Such a lease, therefore, is a true lease and all rental payments are fully deductible for income tax, says J & L.

The customer who buys a Jones & Lamson machine under the instalment plan makes a 25% down payment, pays the remainder to CIT in 60 monthly installments. Interest rate is reported to be 3¼%.

Mr Andrews points out that leasing may be advantageous when working capital is inadequate for necessary plant modernization or expansion, and when alternative uses of capital are more pressing or more profitable.

Jones & Lamson states that the new financing and leasing plan, which will be widely advertised, will apply to all its products—turret lathes, Fay automatic lathes, thread and form grinders, optical comparators, threading dies and specially designed machines.



Sharp Upturn in Machinery New Orders (except electrical) Registered by McGraw-Hill Index

NEW YORK—The highest level in nine months was recorded here by the McGraw-Hill Index of New Orders for Machinery (except electrical) for the month of June. The June figure represents 94% of the 1950 average, contrasted with the low in May of 79%. The Index, however, is still 6% under June 1953 levels. Although all types of machinery manufacturers made substantial gains in June, office equipment producers registered the biggest advance of the entire group.

The Index averaged 85% of 1950 levels for the first half of 1954. This compares with 103% in the first half of 1953 and 94% in the second half of last year. The McGraw-Hill Index is a measure of monthly changes in new orders for machinery and parts as received by machinery manufacturers, excluding electrical, farm and household machines.

Lester M Cole

Thomas F Morrow

William Irrgang

Names in the News . . .

Lester M Cole, since 1946 Southern district manager for Warner & Swasey Co, Cleveland, has been appointed general sales manager. Mr Cole started his career with W & S as a tool designer, later becoming sales and service representative in Dallas, Texas, Texas district manager and Southern district manager. Mr Cole will be responsible for sales of all W & S products, including machine tools, textile machinery, and construction machinery. He is a past national director of the American Society of Tool Engineers, and was the organizer of ASTE's Houston chapter.

Rear Admiral Louis Dreller USN (Ret), formerly asst chief of the Office of Naval Materiel, has been named director of engineering for Brad Foote Gear Works, Cicero, Ill, and its subsidiaries, American Gear & Mfg Co, Lemont, Ill, and Pittsburgh Gear Co, Pittsburgh.

Thomas F Morrow, since 1952 works manager of the Detroit plant, has been named general manager of Defense Operations for Chrysler Corp and will be responsible for obtaining new defense business for Chrysler, for supervising the company's tank manufacturing operations, and for overseeing Navy jet engine production. Mr Morrow joined Chrysler 18 years ago as an assembly line worker.

Eugene Parks, formerly with Grotnes Machine Work Inc, Chicago, has been appointed president of Fonda Gage Sales Corporation, Stamford, Conn.

Mrs Dorothy M J Tracey has been elected president of Tompkins-Johnson Co, Jackson, Mich, succeeding her father, the late A R Johnson. Mrs Tracey was formerly executive vice president and general manager of the company.

William Irrgang has been elected president and general manager of Lincoln Electric Co, Cleveland, succeeding **James F Lincoln,** who has been named board chairman. Also elected was company founder **John C Lincoln,** retired, to honorary chairman of the board and treasurer. **John S Roscoe** was elected executive vice president (succeeding Mr Irrgang). **A F Davis** was named vice president and secertary; and **George Landis,** vice president.

C I Bradford, vice president and director of operations for Rem-Cru Titanium Inc, Pittsburgh, has been named company president and board member, succeeding **Walter U Reisinger,** who resigned July 1. **R S Poister,** vice president, Crucible Steel Co of America, was elected chairman of the board of Rem-Cru, succeeding **William H Colvin,** who retired July 1.

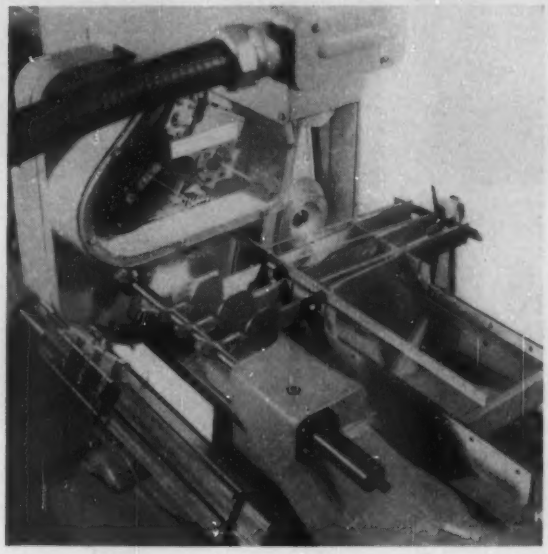
Neal L Cobb, formerly chief of tool design for the Fellows Gear Shaper Co, Springfield, Vt, as of July 1 was appointed chief engineer of the company.

Rear Admiral Louis Dreller

Mrs Dorothy M J Tracey

Neal L Cobb

New Shop Equipment,



Electronic Unit Mills Master Airfoils

Model 102 electronic airfoil milling machine was manufactured by the New England Machine and Tool Co — sales and engineering will be handled by Pratt & Whitney. A non-contacting tracer control and a fair-curve interpolating system are combined in this machine for generating original three-dimensional contoured shapes from a series of simple cross-section templets.

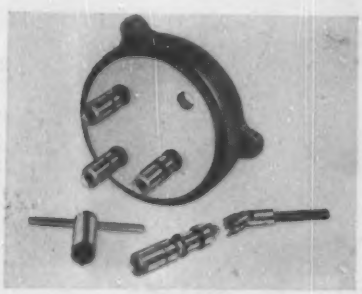
This system — which interpolates between various cross-sections and extrapolates beyond them while continuously producing proper twist in the airfoil — also permits developing blades with various experimental twist conditions without requiring change in the basic setup.

Interpolation is accomplished through the use of commercial feeler stock which acts as a continuously flexing spline, representing successive fairing elements of an imaginary master blade having proper cross-sectional shape, but lacking twist. Twist shape is introduced by programmed rotation of templets relative to work rotation.

The electronic non-contacting tracer operates through a measured 0.001-in. length spark gap and permits following of the flexing feeler stock. Machine, proved during six years in actual job-shop manufacturing, is capable of speed ranges in the vicinity of 25 ipm.

Illustrated on the left is the complete machine, showing headstock at middle of bed, tailstock and carriage at each end. Work is produced at right end, control being at left. The control end of the machine is illustrated on the right, showing the stack of cross-section templets and interpolating mechanism. At upper right the non-contacting tracer is following the thin flexure which is operated by a series of reciprocating bars following rotation of templets. The twist interpolating system is located at lower left.

Pratt & Whitney, Div Niles-Bement-Pond, West Hartford 1, Conn



Fixed Position Plate For Commander Multi-Drill

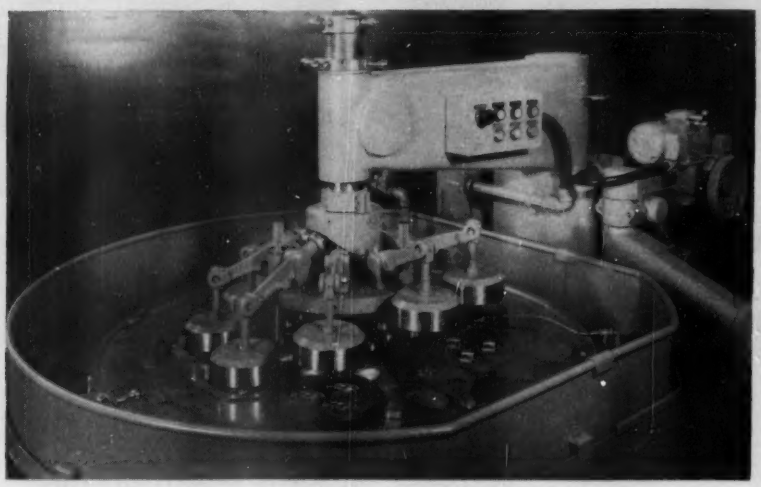
Accessory permits conversion of Commander Multi-Drill to fixed-spindle multiple head without eliminating advantages of adjustability. From 2 to 8 spindles may be installed in the fixed position plate.

Said to be quickly and easily attached to any Multi-Drill, plate provides fast, accurate setups of intermittently run repetitive jobs. Initial setup of plate for specific job requires drilling hole for each lock-in-position spindle assembly using layout guide provided.

Once the plate is set up for a job with spindles and drills properly located, it may be stocked for instant attachment, whenever required. Minimum hole centers of ½-in. to maximum 9 in. are possible with the plate.

Ross Llewellyn, Inc, 228 N La Salle St, Chicago 1, Ill

Materials and Parts . . .



Norton Flat Lapping Machine Has Semi-Automatic Feed

Single-face flat lapping machine, No. 36-F Hydrolap, incorporates provisions for continual lapping and complete lapping of work in single pass around lap. Lapping in a single pass is reported possible because of the greater efficiency of bonded abrasive laps over cast iron laps. Grit is washed away by a stream of filtered coolant.

Lapping is interrupted only to true the bonded abrasive lap. Truing is done by a diamond held in a variable-speed, power-operated truing arm.

An opening is provided in the workholder design to permit truing the lap without removal of the workholder. Truing speed is adjustable — may be set for fast feed or for slow feed to make highly refined surface finishes possible.

Work loading and removal, truing of the lap, and the few functions necessary for machine control, are performed from the operator's position. A work pressure arrangement automatically applies the proper weight to parts grouped in each workholder to secure desired lapping action. This lifts the weights clear as they pass through the loading station.

Machine can be arranged for fully automatic continuous feed operation by addition of suitable loading and unloading devices.

Norton Company, Worcester 6, Mass

Multiple Grinding Wheels

Multiple Grind-O-Flex flexible grinding wheels may be mounted on the same portable-tool shaft by adding a special sleeve to the tool. From two to five wheels may be mounted, adding grinding area but increasing the weight only 7 oz per wheel.

The 1-in.-wide wheels are for finishing, deburring, removing flash, and polishing.

Merit Products, Inc, 4023 Irving Pl, Culver City, Calif

. . . including

Heavy-duty shaper cuts teeth simultaneously on large gears having maximum pitch of 3 page 162

Universal coupling is designed with equilateral tri-lobe shape for increased efficiency page 163

Semi-automatic painting machine achieves high production with inexperienced operator page 164

Prealloyed steel powder allows production of high-strength parts with secondary treatment of simple hardening . . page 166

Double-ram broaching machine, vertical, has electromechanical drive . . . . . page 170

Automatic welding equipment produces beads up to 4 in. wide in single pass . . . . . page 172

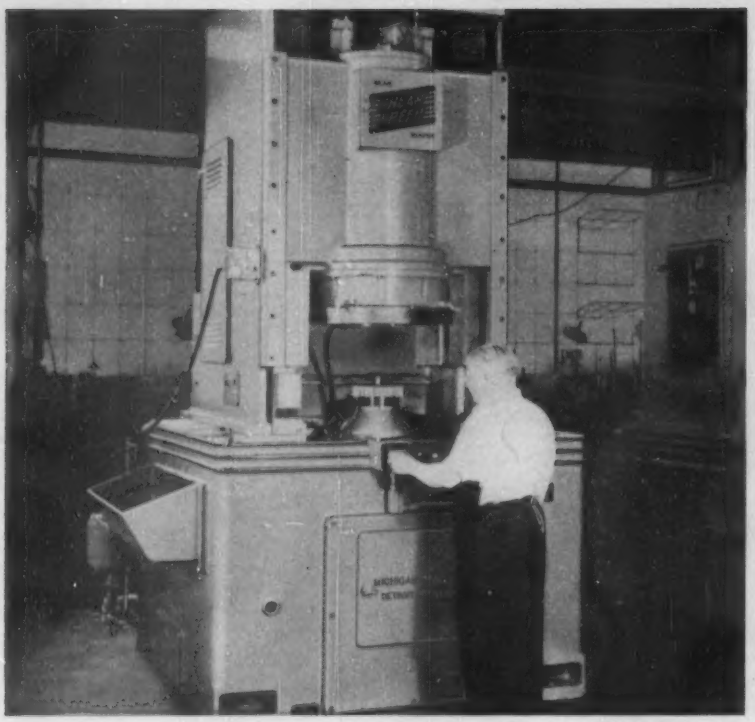
Portable hardness testing instrument makes impressions invisible to naked eye . . page 176

Lathe-tailstock tap-and-die holder can be brought to instant stop by releasing hold on tool . . . . . page 178

. . . and in Aug 16

Precision boring machine is cam-operated, built for fine finishing work.

Gear production machine shaves, inspects, and sorts spur or helical gears at high production rates.



Heavy-Duty Shaper Added To Michigan Tool Line

Shear-Speed line has been expanded by addition of model 18105-HD for cutting teeth on large, coarse-pitch gears. All teeth are cut simultaneously by reciprocating the blank through the cutting head and infeeding the form-cutting tools. This model was designed to cut gears having a maximum pitch of 3—gear shown has a pitch of 3½.

Feed and relief controls and tool sharpening compensation adjustment are located on vertical centerline of head and cutting tools, permitting entire head assembly to be contained in compact and rigid housing.

Teeth are produced with pre-shave forms. The shaper handles gears having face widths up to 4½ in. It has a five-inch stroke and will shape gears with diameters ranging from 5 to 10 in.

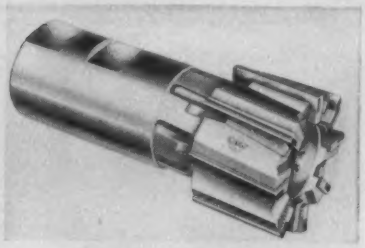
Michigan Tool Co, 7171 E McNichols Road, Detroit 12, Mich

Automatic Winding and Tensioning Control

Hydro-Wind Drive offers automatic winding and tensioning control. Featuring improved construction and larger capacity, unit is available in Models 12.2 and 8.4. Improved features include rearrangement of gear train, better bearing spacing, and carbon - against - Meehanite spring-loaded seal.

Unit incorporates fluid coupling and planetary gear set. Ring gear is connected to impeller, or pump, of fluid coupling. Planet gear carrier is fixed to turbine or runner of fluid coupling, and sun gear is integral with output shaft. To mastermind the operation, the automatic slip of the fluid coupling reacts with the planetary gear set, transmitting increased torque necessary to maintain desired tension, while roll rpm decreases and roll diameter increases.

Twin Disc Clutch Co, Dept D8, Racine, Wis



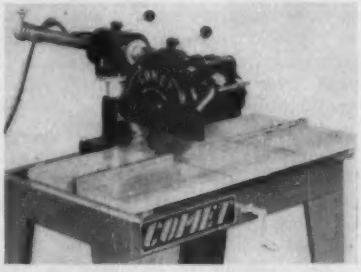
Straight End Mills Now Standard Items

Two series of straight-shank, carbide-blade end mills are now available; one for cast iron and nonferrous metals, the other for steel.

Shanks are 2 in. in dia; cutting faces range from 2 to 4 in. Serratip design provides thick carbide blanks with thin metal backing that only contributes the serrated surface.

Fine-pitch carbide cutters are thus available with the advantages of inserted blades. Serrations are 1/16-in. pitch, and blades are adjustable for 5/16 to ½ in. of effective tool and grinding life.

Goddard & Goddard, 12280 Burt Rd, Detroit 23, Mich

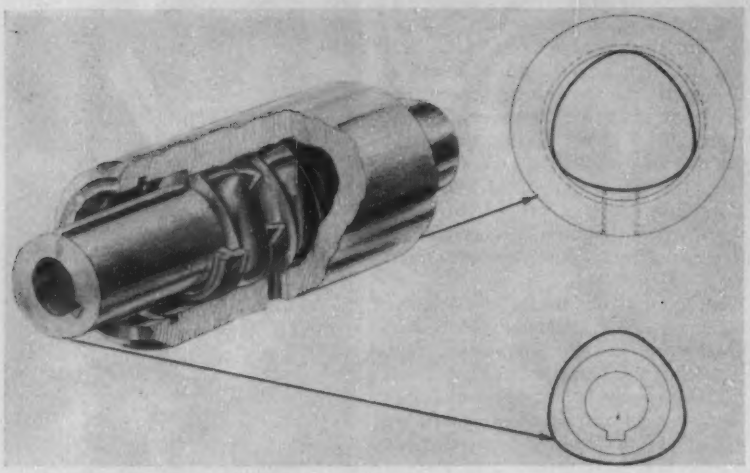


Radial-Arm Saw In New Model

New model of Comet radial-arm saw has starting switch close to pull handle. Machine now raises and lowers from front. Each turn of the handle raises or lowers it 1/16 in. Large red dial plates, placed in convenient position, have also been added.

A redesigned saw guard with anti-kick back dogs is adjustable up or down, forward or back. Saw dust chute is located higher on guard. Wider cutting table has been added.

Consolidated Machinery and Supply Co, 2033 Santa Fe Ave, Los Angeles 21, Calif



Tri-Lobe Shape Design For Universal Coupling

Kerns Manufacturing Corp universal coupling, designed with the equilateral tri-lobe shape on its driving members, has high torsional strength and angular displacement. Kerns states that development of this design was prompted by the fact that equivalent couplings of the pin, splined, keyed, or flexible type, accurately made, are costly and limited in life expectancy when set to maximum misalignment.

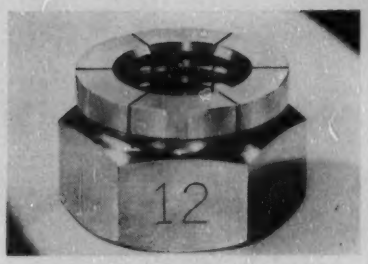
The tri-lobe shape is composed of a combination of radii and void of tangent flats. An arcuate profile on the periphery of male members provides angular rotational displacement.

Reported to have 15% higher load-carrying capacity, the coupling provides 8° angular rotational displacement and a bearing contact which is 85% of total driving area displacement. Engagement between male and female members is held to a maximum 0.0002 in. side clearance. Work surfaces are finish ground to maximum 10 mu-in. rms. Final shape can be ground from hardened blank.

Driving members are self-centering under all loads. The curvilinear profile permits accurate inspection with conventional instruments used for checking circular work.

The tri-lobe coupling is available in standard sizes up to 5-in. dia. Special sizes, types of material, heat-treat, and finish can be supplied upon request.

Kerns Manufacturing Corporation, 48-15 Court Square, Dept 196, Long Island City 1, NY



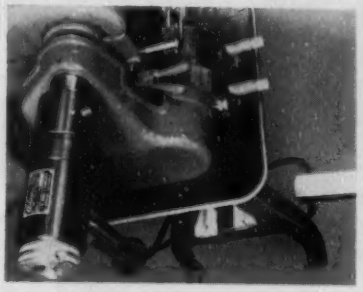
Hot-Spot Nut

Line of Flexloc self-locking nuts resist temperatures to 1200 F. Designed for the tail cone of a gas turbine, can also be used in such hot spots as exhaust manifold systems, furnaces, and firewall assemblies.

The Flexlocs were machined from AMS-5642 stainless steel and are heat and corrosion resistant, silver-plated to eliminate galling and seizure of threads. Under test, they conform to MIL-N-7873.

The nuts are made in seven standard sizes with diameters ranging from No. 10 through 9/16 in.; threads are National Fine series. Units are stop nuts as well as lock nuts.

Standard Pressed Steel Co, Jenkintown, Pa

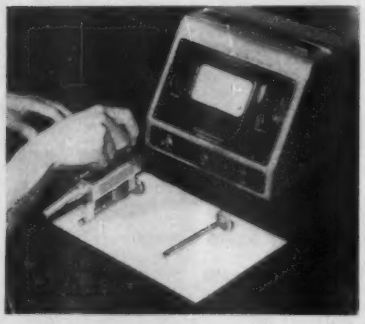


Air-Operated Collet Closer For Use on Variety of Lathes

Air-operated collet closer is available for 1⅜-in. or smaller hollow spindle lathes, using either internal or external collets, with maximum 1-in. bar stock capacity. Unit is designed for spindle speeds to 4500 rpm. Action of the closer is produced by an air-operated piston working on a cam and dog action. By controlled hand adjustment, drawbar pull can be instantly changed from 0 to 5000 lb without changing air pressure.

It has been reported that 2 million stroke actions in an eight-month period produced no measurable wear on mechanical parts or packing. Also, in a second operation, production increased from 2000 units per day to 4500.

I W Adams & Associates, 4200 Burbank Blvd, Burbank, Calif

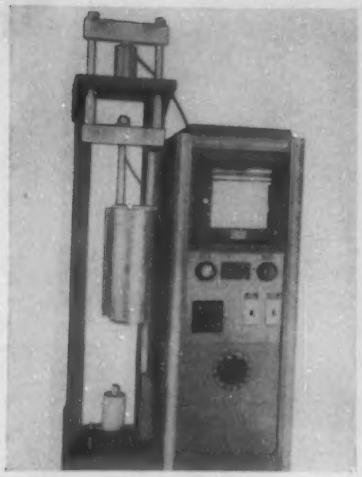


Instrument Sorts Mixed Metal Parts

GM has developed an instrument for sorting mixed metal parts with varying alloy content. Known as the Thermoelectric metal comparator, it is a portable device and can also detect chills in castings. Favorable results have reportedly been obtained when using it to measure thickness of paint films and metallic plating. Instrument is non-destructive, and uses the principle of a thermocouple. The circuit is a loop of two different metals; the part being tested forms part of loop. Instrument's two probe tips are hot and cold junctions where they touch metal under test.

Because the small difference in temperature between the two tips results in a small voltage, an amplifier is included in the circuit to make possible use of a quick response-time indicator to increase sensitivity.

General Motors Corp, 1775 Broadway, New York 19, NY



Testing Machine Has High Capacity

New automatic high-temperature relaxation-creep testing machine of 10,000-lb. capacity incorporates an SR-4 load cell as an electrical pick-up for load measurement. Varying electrical output of resistance wire strain gages in load cell is amplified to drive the pen across recorder chart. Accuracy is within 1% of reading or ¼% of full scale, whichever is greater.

Standard recorder has 10 in. wide strip chart with 100 divisions for full-scale readings of 10,000, 5,000 and 2,500 lb. The 150-ft chart is driven by a constant speed motor at ¼ in. per hr.

Machine is of welded construction and has recorder and electrical controls in a cabinet mounted alongside it on a common base plate 43 in. wide by 22 in. deep. Machine height is 87 in. Additional information is contained in manufacturer's Bulletin 4208.

Baldwin-Lima-Hamilton Corp, Philadelphia 42, Pa

Air-Hydraulics Index Table Has Outside Working Mechanism

Outside turning and locking index table, called Model No. 48, is designed so that all working mechanism is outside the table itself. Adjustments are made, or working parts removed, without disturbing table or disassembling tooling.

Unit illustrated is 48 in. in dia and 8½ in. thick, has six stations, and is designed for hydraulic operation. Model is available, however, in sizes from 20 to 48 in. in dia, and with six or more stations; all sizes may be equipped for either air or hydraulic operation.

When equipped for air, table operates on ordinary line pressures from 60 to 175 lb.

New table has basically the same indexing mechanism as other Air-Hydraulics units. Cushioned stop prevents wracking jar. As loads and diameters are increased, cushioning can be increased to allow maximum speed of operation without damage to mechanism or work.

Air-Hydraulics, Inc, 248 Belden Rd, Jackson, Mich

RotoSprayer Reduces Painting Time

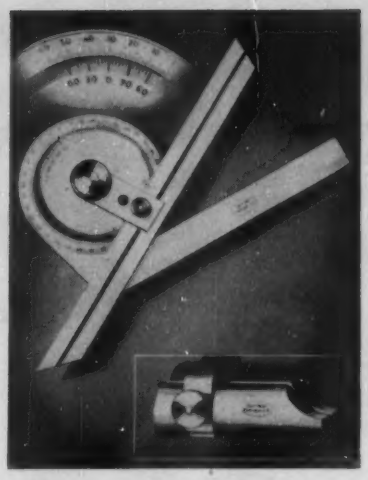
Semi-automatic painting machine is said to allow inexperienced operators to get high production because operator only needs to load the part and touch the foot-valve, then machine takes over.

It automatically grips the part, rotation starts, paint guns go on, then off, rotation stops, and hold-down releases.

An oscillating gun is provided but there are also stationary gun positions. For easy feeding of parts, mask opening always comes to same position when spindle stops rotating. Speed of rotation, timing of paint guns, gun oscillation, and air pressure are set by control knobs.

RotoSprayer is a complete painting machine including booth, fan, guns, and pressure tank. It is 100% air-operated, eliminating fire hazard. Filtered air carries lubricant to moving parts.

Finish Engineering Co, Inc, Erie, Pa



Vernier Bevel Protractor

Universal vernier bevel protractor with Lustro-Chrome finish over entire measuring dial eliminates glare, making measurements easy to read and protecting surface from rust and corrosion. All parts are made in thickness of 0.100 in. to prevent deflection and assure accuracy. Any angle can be measured to 5 minutes by means of vernier. Regularly equipped with 6-in. blade, additional 12-in. blade can be furnished, also a stand with precision lapped base which can be set up on shafts as well as flat surfaces.

George Scherr Co, 200 Lafayette St, New York 12, NY

Portable Seam Cleaner

Portable steam cleaner cleans, degreases, and removes contamination without disassembly, from otherwise inaccessible parts. Unit is said to be safe and simple to operate—fill with water, plug in. Electrically heated on standard circuit, thermostatically controlled.

Halkirk Co, 2004 Strand, Manhattan Beach, Calif

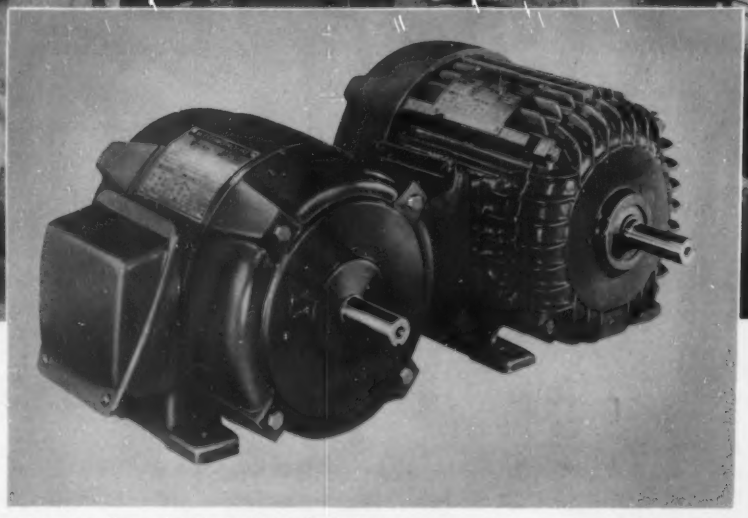
AV drive mounted on
colun.n saves floor space.

Westinghouse Drives whittle down maintenance and handling costs

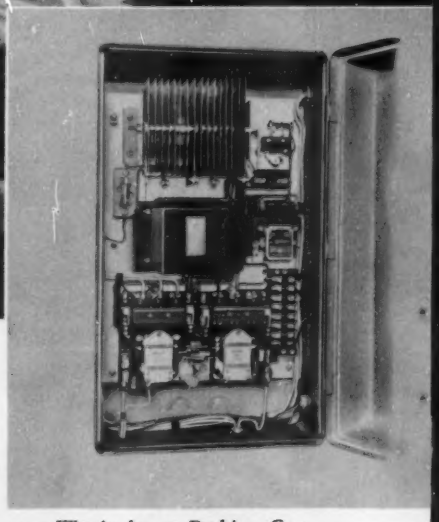
M. E. Knudson, Manager, Steel Mill and Metalworking Sales, shows on the following 3 pages how coordinated Westinghouse equipment, backed up by engineering help, saves money.

Two Westinghouse Motors power this surface grinder, working on valve plates. It doesn't need the speed finesse required on the centerless grinder, but its controls must have protection from splashing oil. A Westinghouse Oil-Tite* Pushbutton Station, conveniently located, answers that problem.

* Trade Mark



New totally-enclosed Life-Line® "A" motors are designed to give you greater application flexibility at locations where motors get heavy doses of chemicals, liquids, dust and dirt. Every component in the new motor is redesigned and integrated with the whole.



D-c braking, with a new Westinghouse Braking Controller like this, stops a motor without having mechanical apparatus attached to the motor shaft. It provides a smooth rolling stop with no reverse rotation. Use d-c braking for stops to change tools or prevent damage.

Coordinated drives on grinders save maintenance time and money

Westinghouse Engineers, called in to help a customer with application problems, make a habit of coordinating electrical equipment in dollar-saving ways. The flexibility of the Westinghouse complete line—plus the equipment's ruggedness and maintenance-free features—makes their job easier. Here are some examples:

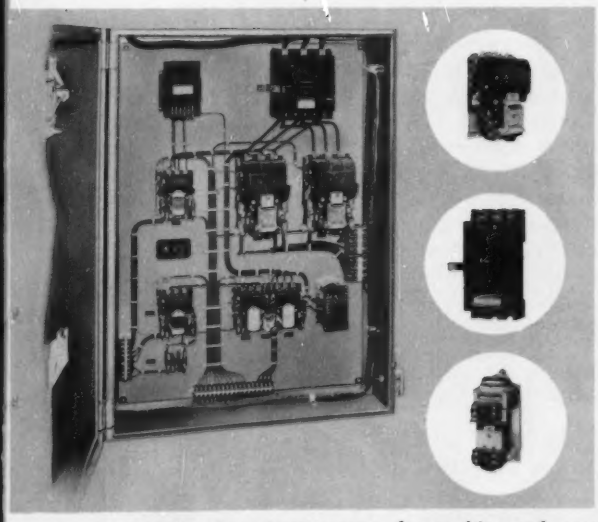
Westinghouse Life-Line AV Drive package has proved its efficiency over many years of rugged assignments. It's a complete, adjustable-voltage drive system—a factory-engineered package with selenium excitation. Use it wherever you need exacting control of a d-c motor from an a-c power line. Choose any of the Life-Line d-c motors or gearmotors—explosion-proof, dripproof, totally enclosed—and you'll get these features: rugged construction; dynamic balancing of all rotating parts; Tuffernell® insulation of windings for maximum strength; pre-lubricated bearings.

Life-Line contactors and other heavy-duty control components—proved in the toughest industrial application—are used in the design of the AV drive. For example, the contactor is designed with fewer moving parts. The entire contact assembly pivots on a knife-edge of specially hardened steel. There are no sliding surfaces to bind or wear, and no misalignment troubles. Nothing can jam or stick. Kickout springs give sure contact openings, independent of gravity.

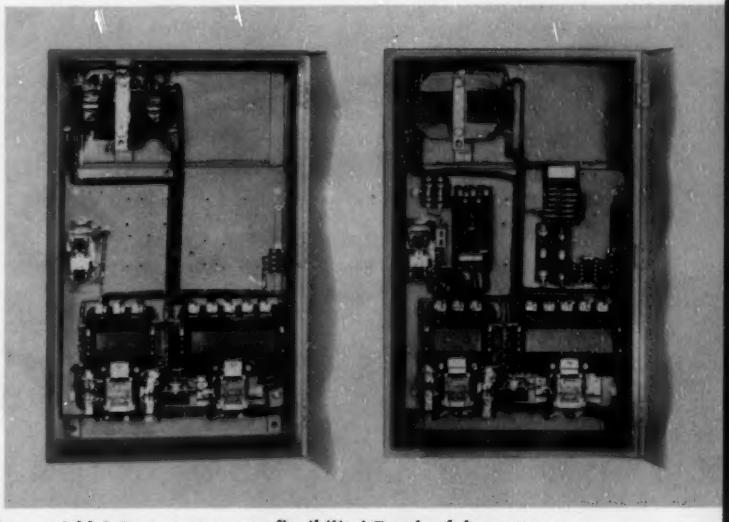
Westinghouse Mot-O-Trol®, used for operation of d-c motors from a-c sources, starts the motor and brings it rapidly and smoothly to a pre-set speed. Mot-O-Trol drive systems, designed specifically for metal-working applications with speed ranges in excess of 100 to 1, are available. You get automatic speed regulation, and the single dial provides finger-tip control throughout the entire speed range.

YOU CAN BE SURE...IF IT'S

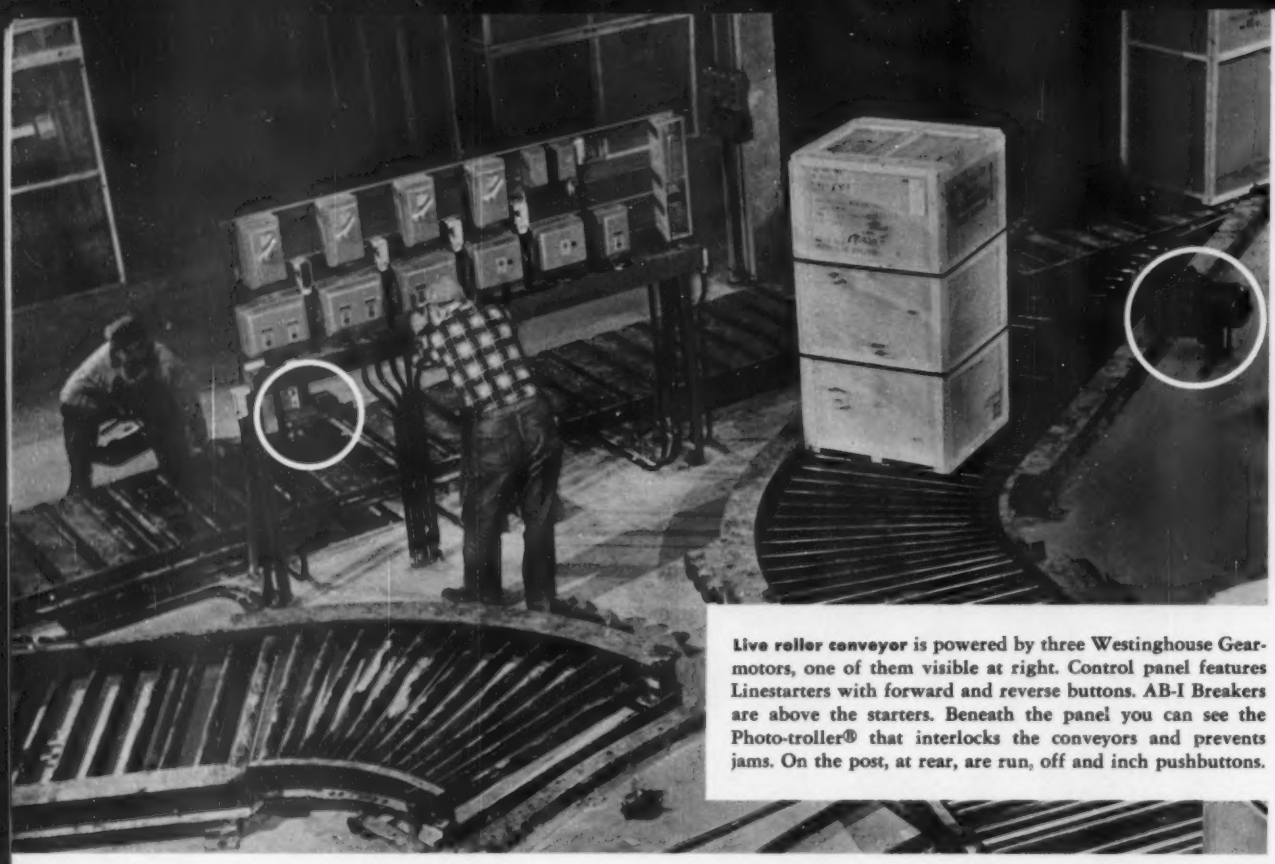
Westinghouse



Complete line of components for machine tool control panel—that's what Westinghouse offers. Life-Line Contactor (top inset) is a make-up device. AB Circuit Breaker (middle) has De-ion® arc extinction. Type AM Time Delay Relay has double-make, double-break contacts.



Add-A-Part panels mean flexibility! Panels of the starters on this exclusive Westinghouse innovation have drilled and tapped holes to accommodate any common modifications you need. It's easy to modify new starters right on the spot by adding transformers, fuses, or timing relays.



Live roller conveyor is powered by three Westinghouse Gearmotors, one of them visible at right. Control panel features Linestarters with forward and reverse buttons. AB-I Breakers are above the starters. Beneath the panel you can see the Photo-troller® that interlocks the conveyors and prevents jams. On the post, at rear, are run, off and inch pushbuttons.

Gearmotors . . . plus traffic lights . . . run this 3-track intersection

Westinghouse equipment and engineering save money in the warehouse, too. Apart from the obvious cost reduction gained by automatic materials handling, there's a saving here in maintenance dollars. Westinghouse Gearmotors, for example, have the exclusive horizontal split gear case that makes inspection simple and speedy. Remove a few bolts, lift the gear cover, and all gearing parts are ready for removal. No intricate subassemblies. No need to drain oil, disturb the unit's mounting, or disconnect it from the driven load.

AB Breakers give you long, maintenance-free service in your distribution system. Check these construction "firsts": non-welding, silver-alloy butt contacts . . . corrosion-resistant bearings and parts . . . electrically welded connections. De-ion arc quenching—instant, safe extinguishing of hot arcs—means protection and long breaker life.

Backing up Westinghouse apparatus and engineering assistance are important extra services. Repair Plants — 38 of them — are equipped to repair all types of electrical apparatus. Renewal Parts Warehouses are located in 31 industrial centers. You'll find your nearby Westinghouse representative eager to put these facilities at your service. Westinghouse Electric Corp., 3 Gateway Center, Pittsburgh, Pa.

MP-3018

YOU CAN BE SURE...IF IT'S Westinghouse

Perry Croce, Engineering Manager in the Westinghouse Pittsburgh office, backs up salesmen in his territory with first-class engineering help. Put him—or his counterpart in your area—to work for you. Ask your Westinghouse representative for these books: *New Life-Line "A" Motor* (B-6154-A), *AV Drives* (B-5808), *Complete Industrial Control* (B-6051), *Automatic Control* (B-5882), *Westinghouse Equipment for Automotive Industry* (B-5651), *Westinghouse Gearmotors* (B-5645), *Westinghouse Speed Reducers* (B-5646). Or write to Industrial Products Advertising, Westinghouse Electric Corp., 3 Gateway Center, Box 868, Pittsburgh 30, Pa.

MP-3018

FYI
FOR YOUR INFORMATION

FREE Catalogs, Booklets, Charts, Calculators

FYI—these initials symbolize information that's important. And there is much of importance in the literature listed here. To get the ones you need, all you do is fill out one coupon for each booklet you wish to order. Indicate in the circle on the coupon the number of one catalog wanted. When you have filled out a card, detach, stamp, and mail We'll do the rest.

MACHINES AND ATTACHMENTS

1 PRESS BRAKES—*Niagara Machine & Tool Wks, 637 Northland Ave, Buffalo 11.* 32-page Bulletin 89-C covers series N and E press brakes with double-end twin drives and rigid frames, in capacities from 50 to 775 tons. Booklet lists features, shows fundamentals of press-brake work.

2 HEAVY MACHINE TOOLS — *Schiess-Aktiengesellschaft, Duesseldorf, Germany.* Catalogs of 8 to 16 pages cover crankpin-turning, horizontal boring and milling, precision gear-hobbing, vertical boring, double-column boring, and single-column turret machines. All are for heavy machining on large components.

3 CENTERLESS GRINDERS—*Landis Tool Co, Waynesboro, Penna.* 4-page Bulletin CT-54 outlines features of No. 12 and 12½ precision grinders for infeed or thrufeed.

4 UNIVERSAL GRINDER — *Rivett Lathe & Grinder, Inc, Brighton 35, Boston* 16-page catalog is on model 1024 internal and universal hydraulic grinder with double-end wheelhead, internal-spindle speeds to 35,000 rpm, workhead-spindle speeds to 600 rpm, and capacities to 9 in. ID on holes and 12 in. OD for external work.

5 BORING MACHINES — *Maschinenfabrik Froriep, GMBH, Rheydt, Germany.* 4-page pamphlet on double-column vertical boring and turning machines describes equipment for heavy-duty work. Also available is folder on boring mills for railroad tires.

6 WHEEL DRESSER—*Pratt & Whitney Div, Niles-Bement-Pond Co, W Hartford Conn.* 4-page booklet shows Diaform wheel dresser, sample work, and form cams with which it operates.

7 AIR CONTROLS—*Pantex Mfg. Corp, Pawtucket, RI.* 8-page folder lists and described methods of hooking up two-lever coordinated control for operating air-powered equipment manually and automatically.

8 MOTOR PULLEYS—*Reeves Pulley Co, Columbus, Ind.* 28-page catalog shows complete line of redesigned motor pulleys for new NEMA frames, in eight sizes from ½ to 15 hp, and in speed ratios up to 4:1.

9 SPINDLE BEARINGS—*Cincinnati Milling Machine Co, Cincinnati 9, O.* 16-page promotion booklet shows details of Filmatic bearings on Cincinnati grinders in series of "X-ray" illustrations.

10 POWER CHUCKS—*Skinner Chuck Co, New Britain, Conn.* 2-page data sheet covers close-coupled non-rotating power-chuck fixtures, with 8-, 10-, or 12-in. chuck.

11 FLUID CONTROLS — *Barksdale Valves, 5125 Alcoa Ave, Los Angeles 58.* 32-page data book on hydraulic and pneumatic controls shows valves and pressure switches in selection charts for engineering use.

TOOLS AND ACCESSORIES

12 TAP DRIVERS—*Scully-Jones & Co, 1901 S Rockwell St, Chicago 8.* 4-page bulletin 20-50 covers Safe-Torque releasing, adjustable-torque drivers in ranges from 10-32 to ⅝ in. Ratings are based on Iowa State College and company tests.

13 CHUCKING REAMERS—*Pratt & Whitney Div, Niles-Bement-Pond Co, W Hartford, Conn.* 4-page folder describes straight-flute reamers of HSS, straight or taper shanks, in standard sizes; also reamer blanks.

14 TUBING TOOLS—*Imperial Brass Mfg Co, 1200 W Harrison St, Chicago 7.* Pocket-size catalog shows complete line of cutting, flaring, bending, swaging, reaming, and pinch-off tools for copper, aluminum, steel, and stainless tubing.

15 TOOLS & GAGES—*Gauge & Tool Makers' Assn, Standbrook House, Old Bond St, London W 1, England.* 154-page catalog, third edition, in English, French, and Spanish, shows products of 300 member firms, which span fields of gages, press tools, cutting tools, testing machines, jigs, and fixtures.

16 BROACHING TOOLS — *National Broach & Machine Co, 5600 Jean St, Detroit 13.* 8-page folder tells of 25-year experience in broaching, with accounting of best practice, fundamentals, design, materials, and components made by broaching.

17 RIVETING TOOLS—*Hi-Shear Rivet Tool Co, 8924 Bellanca Ave, Los Angeles 45.* 24-page sixth-edition catalog shows guns, bucking bars, removal tools, gages, and bolt tools, including new part

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numbers, and features exceptionally good sketches of parts and riveting operations.

HEAT-TREATING AND WELDING

18 WELDING EQUIPMENT — *Liquid Carbonic Corp, 3100 S Kedzie Ave, Chicago 23.* Catalog of welding and cutting equipment includes complete line of Gasweld equipment for welding, cutting, and heat-treating.

19 STAINLESS ELECTRODES—*A O Smith Corp, Milwaukee 1, Wis.* 24-page catalog is first by company on stainless-steel welding electrodes, and covers electrode metallurgy, specifications, applications, and recommendations. Tabular material shows sizes and grades.

20 VACUUM FURNACES—*F J Stokes Machine Co, 5500 Tabor Rd, Philadelphia 20.* 12-page Bulletin 790 covers vacuum-sintering, annealing, hardening, brazing, and degassing, with references to movable heat sources, tilting furnaces, and movable-retort furnaces.

21 SEAM WELDER—*Sciaky Bros, Inc, 4915 W 67th St, Chicago 38.* Folder shows MP 2 air-operated, press-type, low-impedence, single-phase seam welder with 3-in. electrode stroke and optional features.

PLANT-SERVICE EQUIPMENT

22 GASOLINE TRUCK—*Yale & Towne Mfg Co, 11,000 Roosevelt Bldg, Philadelphia 15.* 8-page folder introduces G-52 series of gasoline trucks in capacities of 1, 1½, and 2 tons, with more power, better maneuverability, fluid coupling, special muffler, and four-pinion differential.

23 DRAGLINE TRUCKS—*Lewis-Shepard, Watertown, Mass.* 4-page folder shows Floormaster trucks for in-floor and overhead conveyor lines. Features are double-angle welded constuction, cam release of dragline, and sealed wheel bearings.

● HOPPER RACKS—*Chas Wm Doepke Mfg Co, 8813 Blue Ash Rd, Rossmoyne, O.* Bulletin explains NesTier hopper rack for small-parts handling and storage. Request on company letterhead required.

25 INSTRUMENTS — *Minneapolis-Honeywell Regulator Co, Wayne & Windrim Aves, Philadelphia 44.* Volume 7, No. 1 of "Instrumentation," 48 pages, has articles on atomic research, instrumentation in a paper mill, heat-treating department, drug plant, bakery, and aircraft plant. Also available is index of all articles published from 1943 through '53.

26 TRACTOR TOOLS—*Owatonna Tool Co, Owatonna, Minn.* 12-page service manual illustrates service tools for Allis-Chalmers industrial trucks, and gives approved procedure in servicing.

27 PORTABLE VENTILATOR—*Mine Safety Appliance Co, 201 N Braddock Ave, Pittsburgh 8.* Single-sheet paper describes and illustrates two-way ventilating system for industrial use. Capacity is 3000 cfm. Unit includes 15-ft, 14-in. duct and two carrying belts for portability.

28 CHECK VALVES—*Williams Gage Co, 1620 Pennsylvania Ave, Pittsburgh 33.* 4-page folder shows silent flanged check valves for controlling water hammer. Various sizes and ratings are listed, and typical applications are illustrated.

29 AIR CONDITIONING—*Acme Industries, Inc, Jackson, Mich.* Catalog explains how water from well, lake, or stream can be source of heat in winter, cool in summer, for year-round air conditioning. Typical heat-pump applications are illustrated. Six models of Flow-Temp unit are specified.

30 TRUCK BATTERIES—*Edison Storage Battery Div, Thomas A Edison, Inc, West Orange, NJ.* 20-page booklet on nickel-iron-alkaline batteries gives data on standard units for industrial trucks. How batteries work and why they are claimed advantageous are explained.

PARTS AND MATERIALS

31 GEARS—*Jackson Gear Co, Box 9503, ETNA, Pittsburgh 23.* 12-page brochure on cut gears shows a number of samples in various applications, methods of manufacture, and standard-data sheet on "Coniflex" mitre gears.

32 PACKINGS—*E F Houghton & Co, 303 W Lehigh Ave, Philadelphia 33.* Six technical bulletins give essential features on six types of industrial packings: rubber O-rings, V-rings, and U-cups, and leather V's, U's, and cups. Each bulletin covers standard sizes and specifications.

33 NYLON BEARINGS — *Kotula Co, 400 Madison Ave, New York 17.* 8-page catalog illustrates standard lines of Nylined bearings and Nyliners for non-lubricated applications. Engineering evaluation information is included in the material.

34 STEEL HARDENABILITY—*International Nickel Co, 67 Wall St, New York 5.* 12-page bulletin documents the idea that the usual hardenability tests are an inadequate basis for selecting steels in some cases. Toughness is shown to differ even when steels have the same end-quench hardness curves.

35 COPPER-BASE CASTINGS—*Presco Casting & Mfg Corp, Chesterton, Ind.* 32-page catalog lists and illustrates die castings, permanent-mold castings, semi-permanent-mold castings, and centrifugal castings of copper-base alloys. Features of various parts are shown to illustrate advantages of the process used in each case.

36 METALS RESEARCH—*Armour Research Foundation, Illinois Institute of Technology, Chicago.* 14-page brochure shows facilities and tells of methods in obtaining fundamental information on materials in laboratory and with 115-man research staff. Facilities for work in powdered metals, electro-chemistry, metallurgy of all types, and welding are listed.

37 ELECTRICAL COMPONENTS — *General Electric Co, Plainville, Conn.* 100-page bound catalog 1025 shows circuit breakers, switches, and panelboard parts for engineering and purchasing purposes connected with original equipment installations. Over 2500 parts numbers are listed with detailed drawings, prices, and descriptions on most.

38 HYDRAULIC OILS—*Dennison Engineering Co. Columbus 16, O.* 16-page bulletin No. 45 discussed suitable hydraulic oils for company equipment and makes recommendations for specific applications; gives operating advice.

39 PROTECTIVE PAINTS—*American Chemical Paint Co, Ambler, Penna.* Check list shows metal-protective and paint-bonding chemicals for steel, zinc, aluminum, and other metals. It also lists protective processes.

40 RELAYS — *Potter & Bromfield, Princeton, Ind.* 84-page booklet is a compilation of all the papers given at the relay symposium, Oklahoma A&M College, recently. Papers cover various types, actions, functions, and theories connected with relays.

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Cases for Comment

MAINTENANCE

(Case History 4820)

Black & Decker Drill, 16 years old...still going strong.

CONSTRUCTION

(Case History 7338)

Copper roof batting installed 20 TIMES FASTER than old methods with B&D Power.

PRODUCTION

(Case History 10691)

Black & Decker Drill speeds up production and operation 100%.

Hall-Neal, Indianapolis, Ind.

Hall-Neal manufactures furnaces, installs them and air-conditioning equipment. Photo shows ¼" B&D Drill used to drill hole in 22 gauge steel. Also used for general maintenance. The use of the drill has resulted in 100% speed up in operation and production. Company also uses B&D Screwdriver, Heavy Duty Grinder. Some on job 8 hours a day, 5½ days a week for 10 years.

Jim-Note this proof of long trouble-free service

In thousands of cases, industry finds Black&Decker Power gives production a big boost

Here's power to drive drills (and saws, grinders, hammers, screwdrivers) . . . produce more per machine . . . per man-hour.

Here's power *custom-built* for the job. Power built into every B&D Portable Electric Tool because every B&D Tool is driven by a B&D-built motor. And every B&D Tool is built to the latest design with husky housings, precision parts. Year in, year out you can depend on B&D Tools to do the job faster . . . saving time, trouble, money, and manpower.

Don't just take our word for it. Ask around industry. Ask production specialists. Ask time and motion experts. Then try Black & Decker Drills . . . Black & Decker Power. See your B&D Distributor for demonstration. And write today for free, detailed catalog. Address: THE BLACK & DECKER MFG. CO., 604 Pennsylvania Ave., Towson 4, Maryland.

Black & Decker ½" Standard Electric Drill

Black & Decker ⅛" Heavy-Duty HOLGUN* Drill

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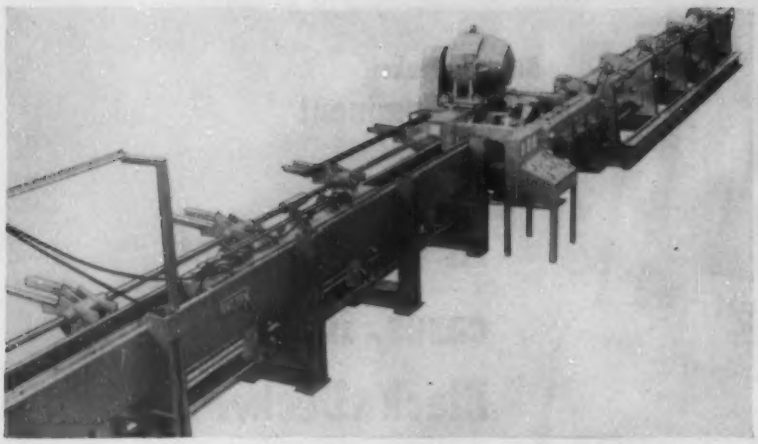


Sutton Straightener Handles Tubes Varying from 1/2- to 3½-in. OD

Straightener was designed with feeding and delivery equipment for straightening tubes from ½- to 3½-in. OD and in varying lengths. Complete installation consists of straightening machine equipped with entry and exit tables. Process operates as completely automatic cycle of feed and delivery or manually from control pulpit.

Designated model 1½B modified tube straightener, unit employs Sutton 5-roll principle of straightening in which central pressure roll is located between two sets of opposed rolls, each set having one driven roll and one idler roll.

Entry table is wood-lined U-shaped trough, adjustable for height, incorporating air-operated pusher carriage which can be adjusted for various lengths. Indexing mechanism automatically delivers tubes singly to trough from entry skids. Exit table is L-shaped wood-lined trough, adjustable sideways as well as for height. When straightened tube is advanced by succeeding tube so it is clear of machine, it strikes flag switch which automatically delivers tube to receiving skids. Both entry and exit tables can be operated manually or automatically. When tables and straightener are set for automatic cycling, complete unit will index, feed, straighten, and deliver tubes to receiving skids.

Sutton Engineering Co, Bellefonte, Pa

BENCH FIXTURE L-145 is used for making rapid production Cadweld connections of welding cable to all Caddy arc welding accessories, plus splices of the welding cable. Fixture is illustrated with electrode holder jaw and cable in position to be Cadwelded. Features reported are: connections made faster, surer; quick-acting cable clamps lock cable into position; life of individual molds increased; and mold changes for various size cable made in seconds —

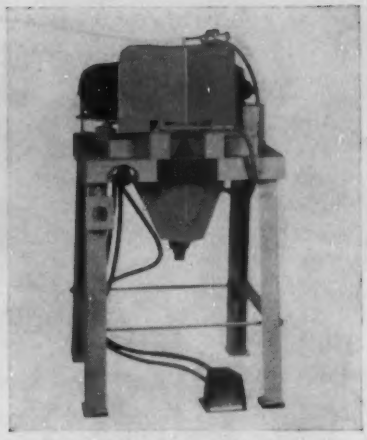
Caddy Arc Welding Accessory Division, Erico Products, Inc, 2070 E 61st Place, Cleveland 3, Ohio

Prealloyed Steel Powder Provides High Strength

Grade 4650-A is a prealloyed steel powder said to allow fabricators to produce high-strength parts by briquetting and centering without resorting to secondary treatments more elaborate than simple hardening. The powder is reported to have excellent green strength and to be readily moldable at low pressures to yield dense, strong compacts. Basically a nickel-molybdenum composition, the grade is also available with other carbon contents. Other improvements stated by the company are ease of heat treatment, toughness comparable to alloy steel, and strength which eliminates costly procedures necessary to strengthen other metal powder parts.

Powder parts will permit manufacture of gears and other high-strength, high-production parts.

Vanadian-Alloys Steel Co, Latrobe, Pa

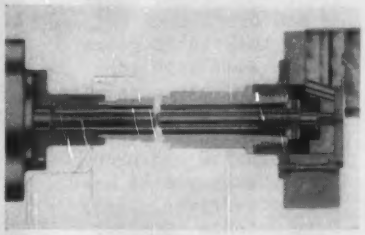


Machine Cuts Two 45° Miters In a Single Operation

Model DM-10 two head mitering machine cuts two complete 45° miters in one operation. Unit is designed essentially for cutting extrusions in aluminum, brass, and copper. High-volume production machine has completely automatic cutting cycle, activated by hand or foot-operated controls.

Model is furnished complete with all motors, four Si-Maloy 10-in. saw blades, and oil mist spray for longer blade life, for immediate cutting when attached to electrical source.

Stone Machinery Co, 701 Fayette St, Manlius, NY



Power Chuck Unit For Small Lathes

Power chuck unit termed Skinner Junior can be adapted to most small lathes with 1 to 1⅜-in. hole through the spindle. It is light in weight and precisely balanced to minimize spindle bearing and braking loads. Work can be chucked internally or externally with high repetitive accuracy.

This 8-in. three-jaw self-centering chuck has gripping capacity from ¼ to 6 in. Its ¼-in. jaw travel exceeds capacity of any collet.

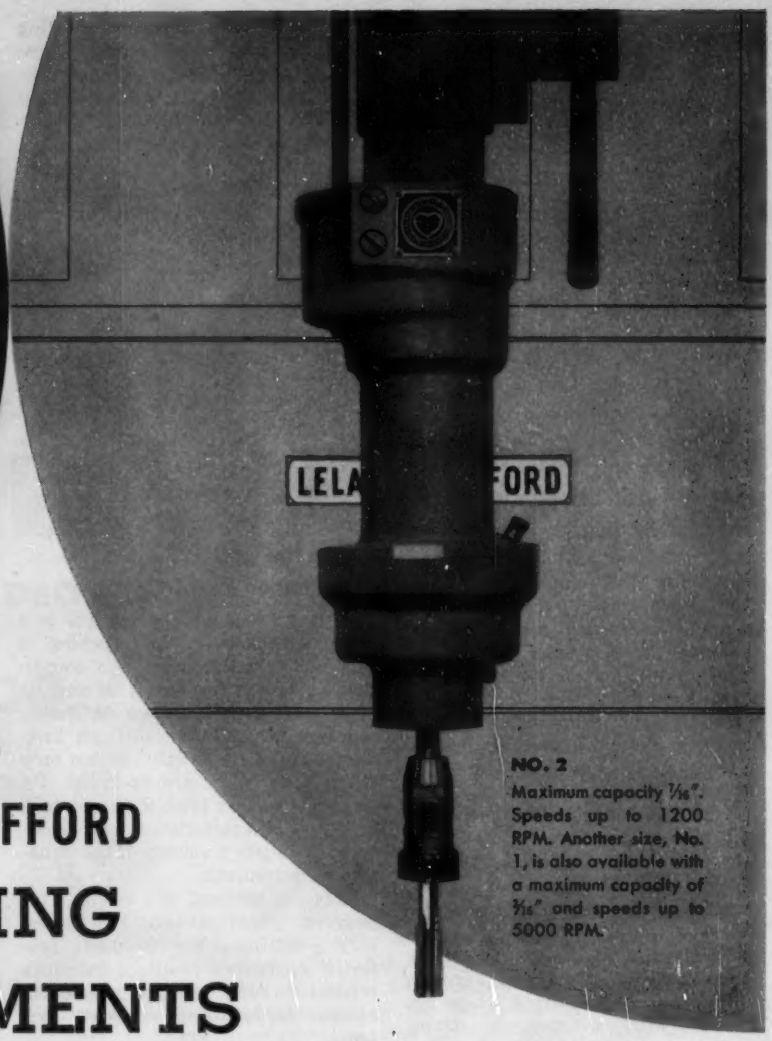
Complete unit includes the wedge-type, self-centering air chuck, a 6-in. high-speed rotating aluminum air cylinder, aluminum cylinder adapter plate, cylinder mounting tube, tube lock nut, and draw bar.

The Skinner Chuck Co, Edgewood Ave, New Britain, Conn

turn potential into profit...

with

LELAND-GIFFORD TAPPING ATTACHMENTS



NO. 2
Maximum capacity 1/16". Speeds up to 1200 RPM. Another size, No. 1, is also available with a maximum capacity of 3/16" and speeds up to 5000 RPM.

Use all the speed, precision and efficiency of your Leland-Gifford Drilling Machines in tapping, too — simply by fitting on a Leland-Gifford tapping attachment.

The operator controls the tapping attachment from the feed lever of the machine — exactly as in drilling. He can thus maintain sensitive, fingertip control at all times — greatly increasing production, tapping to depth with great accuracy and practically eliminating the chance of tap breakage.

Leland-Gifford Tapping Attachments will handle class 3 holes with ease. They attach rigidly to the quill and may be instantly stopped or reversed at any time. Full ball bearing assembly assures smooth operation. Reversal is exceptionally smooth due to the friction of steel acting against Textolite*.

Order one today or write for Bulletin 510-B.

*Plastic impregnated cloth

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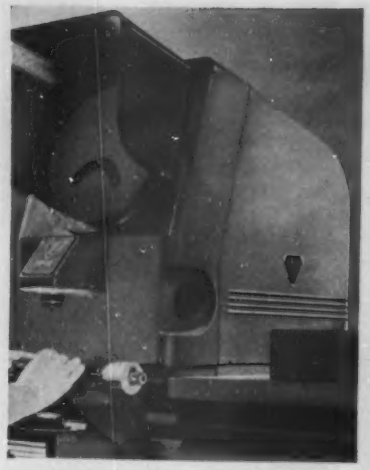
  P. O. Box 217
- **NEW YORK OFFICE**
  75 South Orange Ave.
  South Orange, N. J.
- **LOS ANGELES OFFICE**
  2620 Leonis Blvd., Vernon 58, Cal.
- **INDIANAPOLIS 6**
  P. O. Box 1051
- **ROCHESTER 18**
  P. O. Box 67, Roselawn Station



Optical Bench Comparator Designed by Bausch & Lomb

Optical bench comparator is designed for fast comparison of precision parts against master charts on either large-volume quality control operation or short-run inspections. Focusing is accomplished by a single adjustment knob.

Understage illumination makes stage completely accessible, directly in front of operator, eliminating need for complex fixtures. When large-volume production is involved, operator merely places work on stage, using simple locating stops. The 10-in.-dia, wide-angle screen permits viewing by several people at once. Selection from five different projection lenses provides magnifications of 10, 20, 25, 31¼, and 50X. Through addition of a measuring stage accessory with micrometer drums graduated to 0.0001 in., projector may also be used as a measuring instrument.

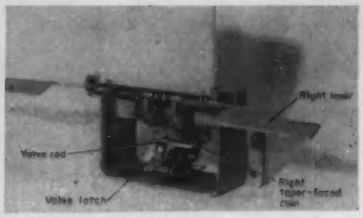
The 110-lb unit is 21 in. long, 15 in. wide, 23 in. high. Regular stage, or worktable, is 6 x 10 in.; measuring stage has a 1 to 2-in. movement.

Distributed by The DoAll Co, Des Plaines, Ill

Vibration Dampeners For Hand Grinders

Vibration dampeners for right-angle-head grinders, air or electric, are designed for use with raised-hub disk wheels, abrasive disks, and cup wheels. They break the solid connection between grinder and grinding wheel or disks with power transmitted through special duPont rubber. They reduce operator fatigue by taking bounce out of grinder. An oscillating action is produced which retards loading and heating, abraded particles are thrown outward from work. Units permit full face application of abrasive disks to work.

J & H Products Co, 3007 Elm St, Dallas 1, Texas



Pneumatic Circuit Coordination Control

Two-lever coordination control is a simple mechanism for opening a pneumatic circuit with the coordinated action of two levers. It consists of an air valve and two extending levers interconnected through linkage which permits valve action only when both levers are operated. By modification of a latch in the control, operating characteristics can be altered to satisfy a variety of coordination requirements.

It can be adapted to a machine to: prevent operation until two necessary conditions are fulfilled; prescribe operator's position; interlock control circuits; control inspection, mechanical-handling, or safety systems.

Control unit is equipped with two air inlets and two outlets. Outlets are fixed 180° apart and double-ended inlet is adjustable through 360°. Length of control, including levers, is 23½ in. It is designed for max air pressure of 125 psi. Price is $61.50.

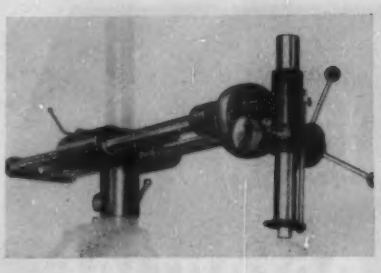
Pantex Mfg Corp, 521 Roosevelt Ave, Pawtucket, RI

Larger Sizes Added to Taper-Lock Sprockets

Line has been extended to include 1½, 1¾, and 2-in. pitch sizes. Users of single strand roller chain can now secure sprockets and bushings for chain sizes from 40 through 160 direct from distributor's shelves.

Sprockets have no flanges or protruding parts, mount on shafts quickly and easily. Taper-Lock bushings are interchangeable.

Dodge Manufacturing Corp, Mishawaka, Ind



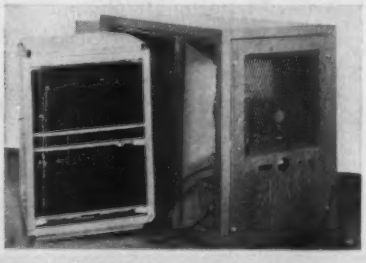
Crossarm Assembly for Metal Disintegrators

Double-barrel crossarm assembly was designed for use with all column-type electro-arc metal disintegrators, where accurate work and frequent changes in setup are required. Assembly provides extra-rigid support for operating head, easy transverse adjustment, independent of angular settings; independent angular adjustments in horizontal and vertical planes; easy duplication of setup; and automatic gravity feed of operating head.

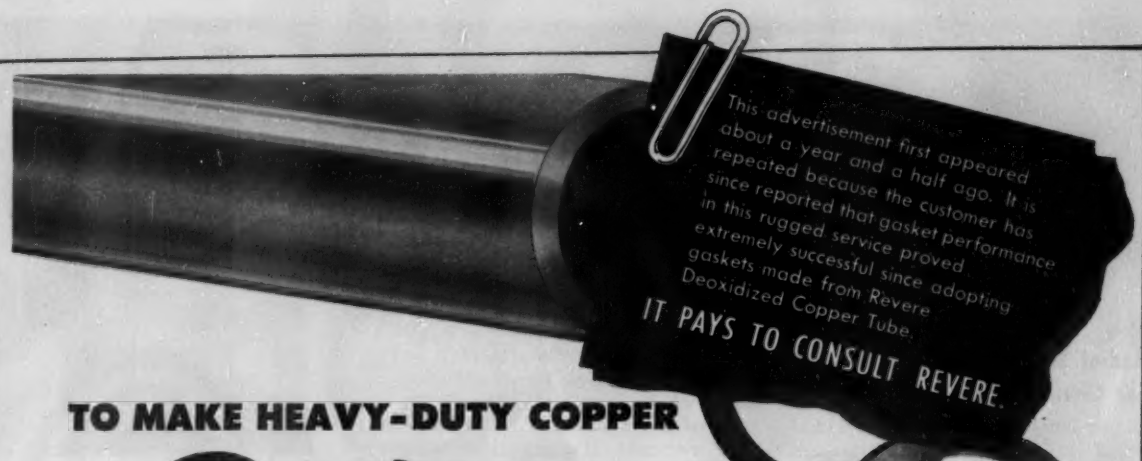
Assembly includes two tubular steel crossarms, each supported by preloaded precision linear ball bearings in front and back of column support casting. Clamp levers provide for locking crossarms without distortion. Assembly can be swung horizontally on column to any desired angle and locked in position. Casting of crossarms supports swivel casting which carries feed mechanism. Swivel can be set at any desired angle in vertical plane, and is graduated in degrees to 90. At zero setting, the head is at right angles to table top in all positions.

Additional details are contained in manufacturer's Bulletin 543.

Electro Arc Mfg Co, Box 448, Ann Arbor, Mich



SPACE CLEANER uses 1000 cfm capacity electrostatic air cleaner. Propeller fan drives air through unit horizontally from one end to other. It is mounted on casters and is 33 in. long, 32 in. high, and 21 in. wide. Dust collector cell can be removed from compartment and cleaned by running water — *The Baker Co, Inc, Maplewood, Maine*



This advertisement first appeared about a year and a half ago. It is repeated because the customer has since reported that gasket performance in this rugged service proved extremely successful since adopting gaskets made from Revere Deoxidized Copper Tube.

IT PAYS TO CONSULT REVERE.

TO MAKE HEAVY-DUTY COPPER

Gaskets

USE REVERE DEOXIDIZED

Tube!

Diesel Fuel Injection Pump, made by American Bosch Corp., Springfield, Mass., and gaskets made by cutting rings off 2" deoxidized copper tube.

• An important extra service rendered by Revere consists of collaboration in setting up specifications. This is valuable because there are many different Revere Metals, each with special characteristics. No one copper, for example, will serve to best advantage in every application. A case in point is the matter of copper gaskets for Diesel fuel injection pumps. Copper is of course an ideal metal for gaskets, and is widely used for that purpose. But for this special application, which copper and in what form? The pump is used on large engines for municipal generating plants. It weighs 186 pounds, and must produce the high pressure required to inject fuel near the top of the Diesel compression stroke. Naturally, the load is a pulsating one. American Bosch Corporation came to Revere with the problem. Our suggestion was that much scrap could be saved if the gaskets were made by cutting rings off copper tube, instead of stamping them from strip. This achieved a double purpose, since the tube is made of deoxidized copper, which is superior in this application to electrolytic. We are able to report that these recommendations proved successful.... This work was done by the Revere Technical Advisory Service. To get in touch with it, see the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

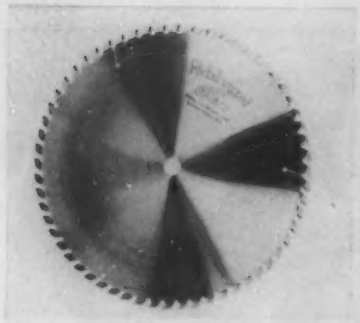
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

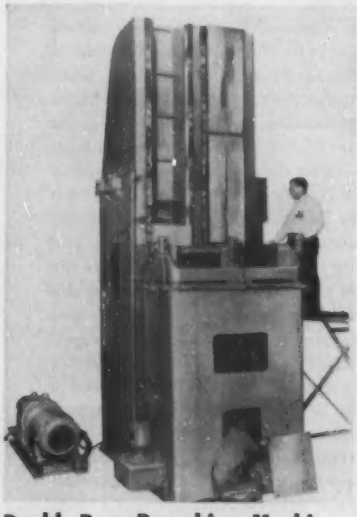


Radial Saw Designed For Cutting Bronze, Aluminum

Blade developed for use on a Radial cutoff machine will cut through bronze barstock in 4 sec. Cuts aluminum extrusions, 24, 53, 75, 61ST, 75 and 14ST6, as well as solid hard stock, and has been known to operate 200 hours before sharpening.

Principal features are a heat-treated, precision-ground, steel blade, designed to avoid vibration at any speed, with permanently brazed, extremely tough, wear-resistant carbide tips. Each Radialloy-tipped blade has full steel backing for maximum support, as well as a special safety lock to prevent tip from flying off.

Radial Cutter Mfg Corp, 831 Bond St, Elizabeth 4, NJ



Double-Ram Broaching Machine Uses Electro-Mechanical Drive

Vertical broaching machine with electro-mechanical drive was primarily designed for high-production broaching of large aircraft engine turbine buckets, but is adaptable to mass production of other parts requiring surface broaching.

Variable speeds are obtained through turn of knob on side of machine. Electro-mechanical drive is designed around constant-torque variable-speed dc motor through a double gear box using a positive lock between the two rams. Main drive gear is continuous-tooth herringbone gear and rack. Second reduction is through helical gears, and third is through spiral bevel gear coupled to dc motor.

Machine is reported to provide an increase in tool life, a saving in down time, and to produce work of great accuracy and fine finish.

Shown above is the machine in process of assembly. Its weight is in excess of 30 tons; slides are 20 in. wide set on 30-in. centers. Ways are lined with natural phenolic. Strokes are available from 70 to 100 in., with motor suited to job requirements.

Lapointe tip-down worktable incorporated in this machine is said to be easy to load and unload, and to minimize operator fatigue. Machine is equipped with hydraulic units for fixture, table and clamps. It has an automatic lubricating system with machine shutoff if oil level is low. Efficient coolant pump and motor unit is mounted on the side.

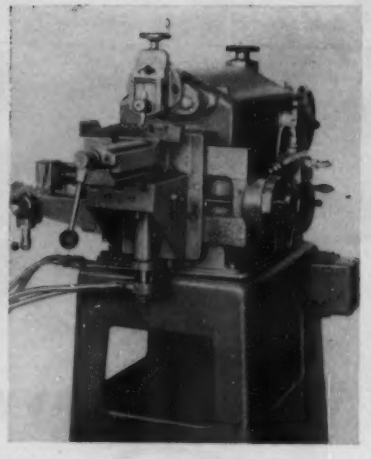
The Lapointe Machine Tool Co, Hudson, Mass

Indicating Gage Checks Crankshaft Dimensions

Indicating snap gage measures crankshafts or similar work where projection require longer reach than usual. Gage is made thin so it can get between shoulders and up the sides of bearings. Anvils are flat and indicator dial is located above handle to be clearly visible. Measurement is transferred from anvil to indicator through integrated pantograph unit which has sufficient resistance to counteract weight of gage and operator's hand.

Gage can be made to any single dimension between 1.875 and 3.00 in. Unit is made of steel with tungsten-carbide measuring tips.

Federal Products Corp, 1144 Eddy St, Providence 1, RI



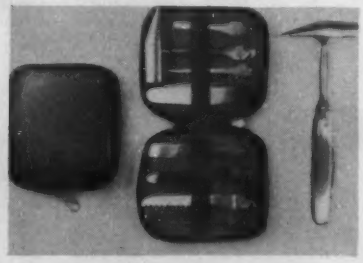
Hydraulic Copying Shaper Has Simple Setup

Hydraulic shaper for tool room, production, or copying work sells for $2900 FOB, NYC. Machine is capable of copying at 1:1 ratio. Work may be held in quick-acting vise or between 360° indexing centers while tracer follows templet.

Easy machine setup and operation reportedly permit the use of semi-skilled help. Not having a crank or gearbox, and using a low hydraulic pressure of 300 psi, shaper is practically free from operating troubles. Hydraulic movement of ram adapts itself to cutting pressure.

Ram speed is variable from 0 to 65 fpm. Cutting stroke length is up to 8 in. and toolhead may be swiveled 45 deg to either side. Adjustment of table may be set to 10 in. transversely and 6 in. vertically. Machine is driven by a 2-hp, 3-phase motor.

American Herforder Corp, 1546 N Orleans St, Chicago 10, Ill



Miniature Tool Kit

Miniature tool kit contains eight tools—hammer, wood chisel, saw, file, drill, punch, screwdriver, and jack knife within snap-on handle. All tools are mounted in zippered cowhide case. Set is manufactured by Hugo Berns of Germany and sells for $13.50.

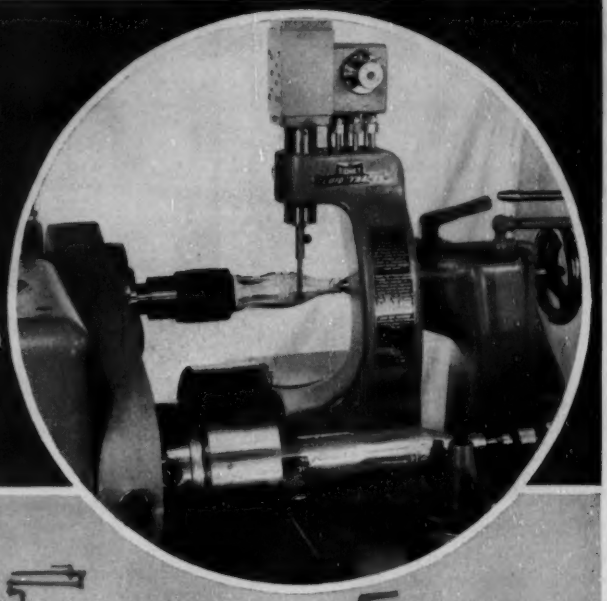
Imported by the Abbeon Supply Co, 159-27 Jamaica Ave, Jamaica 32, NY

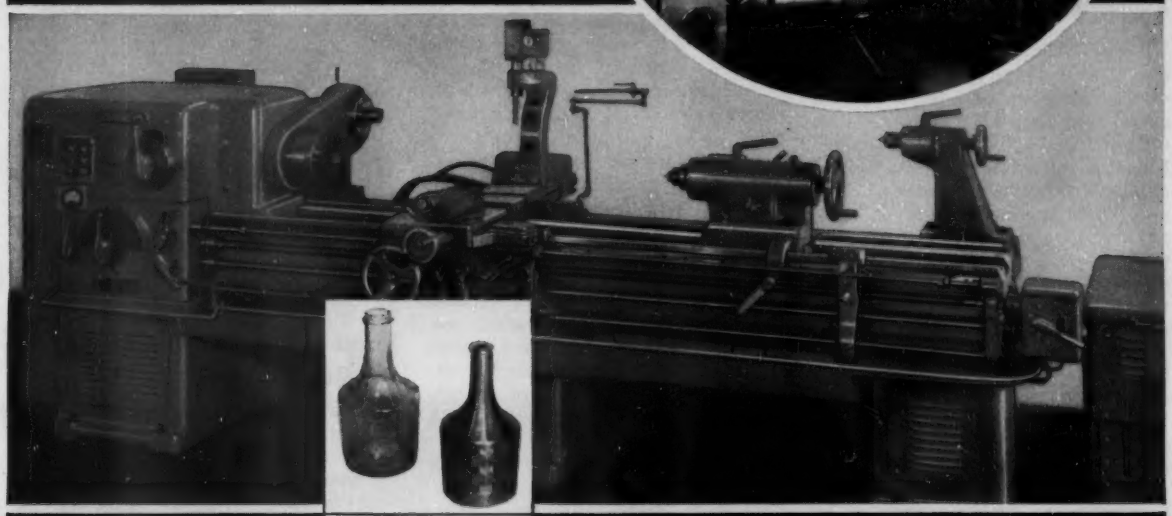
NOW AVAILABLE!

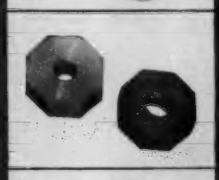
SIDNEY FLUID TRACER LATHES

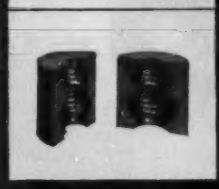
WITH ROTATING MASTER

for use in producing glass molds, plastic molds or for turning cams where radial contours as well as lineal contours must be followed.









We used as "models"—a wine decanter, a soft drink bottle, a liquor flask, a mold for perfume bottles and other odd pieces with the spectacular results shown.

Write for bulletin and details about this newest functional development which saves time and costs.

These unusual "master pieces" produced some amazing results which prove the extraordinary ability of the SIDNEY FLUID TRACER LATHE to reproduce the most delicate and sensitive details and convolutions.

With the ROTATING MASTER the variety of applications of extremely precise turning is practically unlimited. Hairbreadth fidelity of reproduction is assured.

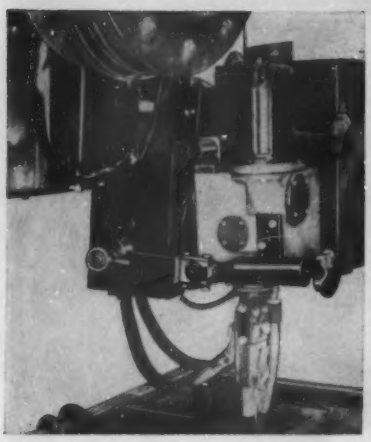
The application of the Rotating Master arrangement in no way decreases the flexibility of the SIDNEY FLUID TRACER. Converting to standard lathe operations can be accomplished without the removal or addition of complicated parts or assemblies.

MEMO

TIME NOW TO REPLACE OBSOLETE EQUIPMENT WITH MODERN SIDNEY LATHES

THE SIDNEY MACHINE TOOL CO. • SIDNEY, OHIO

Builders of Precision Machinery since 1904



Automatic Welding Equipment

Lincoln Electric has announced automatic welding equipment for producing beads up to 4 in. wide in a single pass. Called Spreadarc, it is an attachment that mounts on standard Lincolnweld automatic head and oscillates head back and forth at right angles to direction of travel, with amount of oscillation controlled to produce pads of weld metal up to 4 in. in width. It may be used either to build up a layer of hard surfacing metal or to build up with mild steel.

Spreadarc may be installed on heads now in use without major changes.

Powered by its own variable-speed electric motor which operates through an eccentric to oscillate the welding head assembly, the unit allows a number of oscillations to be controlled by a rheostat on the motor.

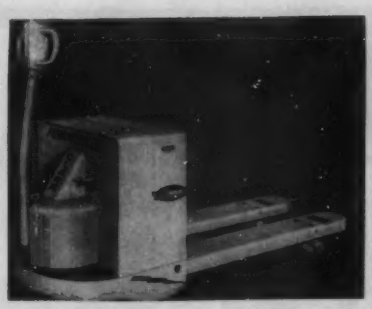
Hardsurfacing employs hidden arc-welding process. Automatic hardsurfacing can be applied to flat and round surfaces. Lincoln states that the speed of welding compared to hand welding has been increased in production jobs by as much as 80%.

Spreadarc is normally used in combination with multiple arc welding using two small wires in place of one larger wire. The two wires and resulting two arcs increase size of weld crater, reduce penetration while increasing deposition rate.

Twin wide adaptation can be made to any standard Lincolnweld automatic head.

Fluxes normally used with Spreadarc for hardsurfacing are agglomerated alloy fluxes. A mild steel or medium carbon wire is used, alloys being added to weld metal through fluxes in the crater.

The Lincoln Electric Co, Cleveland 17, Ohio



Powered Hand Trucks

Clark Equipment announces complete line of powered hand trucks designated Powrworker 26. Highlights include short overall length, max load stability and several distinctive safety features.

Low center of gravity is achieved by battery location; stability is increased by 10½-in.-dia drive wheel driven by high-torque, series-wound motor geared directly to drive-wheel axle.

Brake operates on motor shaft transmitting braking effort from source of power through gear ratio of 22 to 1. Brake is spring applied and actuates dead-man switch which automatically breaks power circuit when steering handle is in vertical or horizontal position. Control box and tubular bayonet-type control handle is a welded assembly mounted to steering handle. There are two speeds, forward and reverse, with defined notched positions.

Drive unit is supported in truck frame by arrangement of wide-spaced thrust and radial roller bearings. All wiring between control and motors is direct to power source.

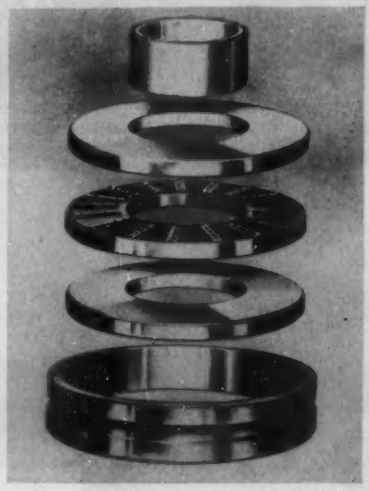
Clark Equipment Co, Industrial Truck Div, Powrworker Section, Battle Creek, Mich

Portable Polishing Stand

Portable polishing stand was designed to eliminate difficulties experienced when attaching and holding flat any optical polishing paper on a metal plate. Paper must be held extremely taut to avert buckling of raised portions to cause dubbing the edges of the work.

With this stand a complete 50 yd roll of 12 in. wide optical paper can be made available for immediate use. Paper is held in recess at one end of unit and threaded across steel plate or stage lapped to high degree of flatness. By means of simple clamping arrangement, a 12x12 section of paper is rigidly held in place on stage.

Crane Packing Co, Dept AMN, 1800 Belle Plaine Ave, Chicago, Ill.



Thrust Roller Bearing Has Modified Spacer Sleeve

Inner spacer sleeve type SDT precision thrust roller bearing has been modified. Steel inner spacer sleeve equipped with bronze inserts has been exchanged for one-piece high tensile sleeve of cast iron.

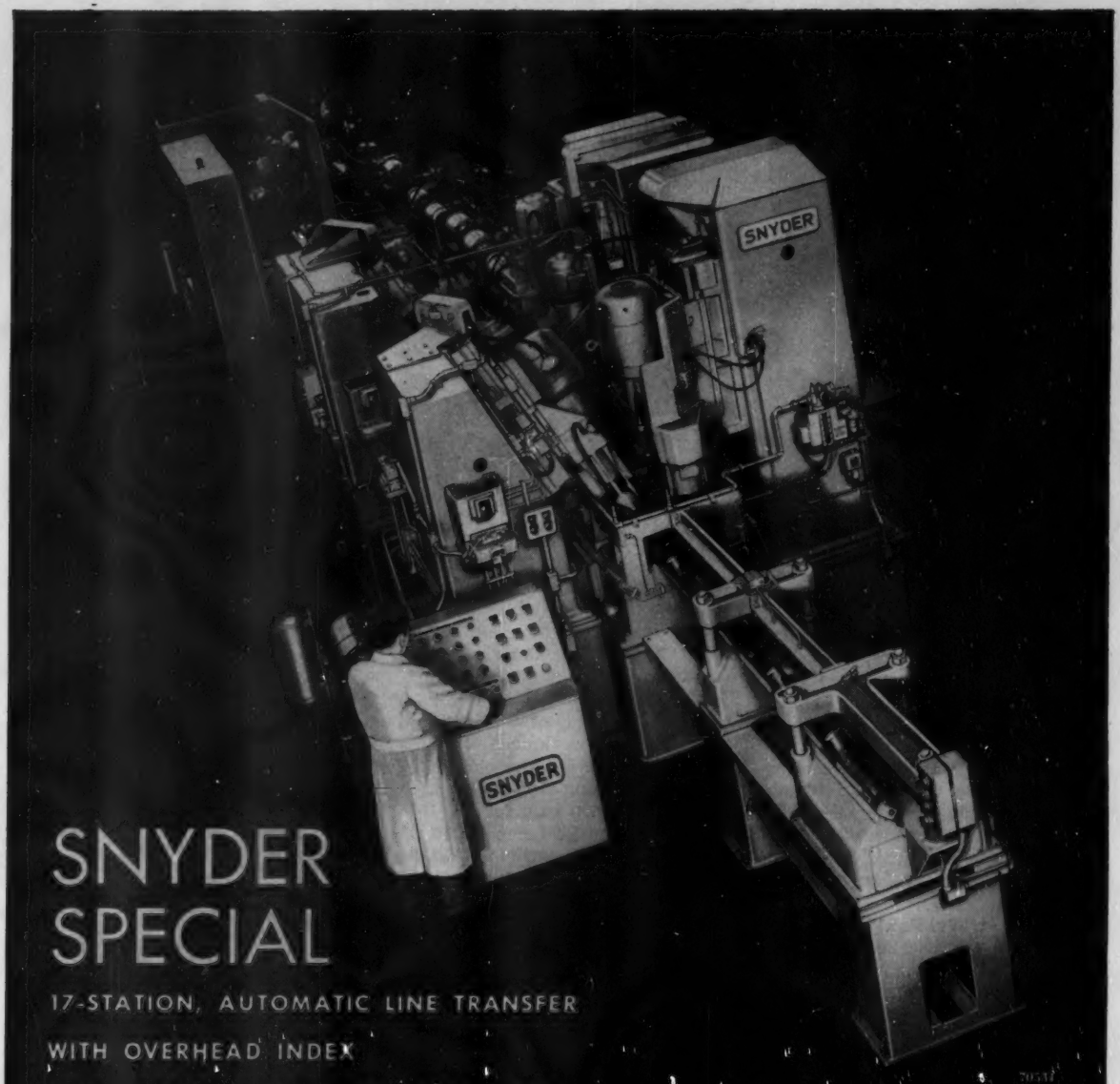
Rollway reports that this type of thrust bearing is used extensively in worm gear assemblies or reducers, or for applications where direction of thrust is frequently reversed.

Physical advantages of cast iron have caused modification in inner spacer sleeve. Both spacer sleeves are finished with the bearing and when the thrust collars are clamped tight against them, assure proper operating clearance of bearing. Design also assures that diameters of backing-up parts, such as thrust collars and housing parts, are of such size that plates of thrust bearing are backed up sufficiently.

Following size ranges are available: inner sleeve bore, 1 to 11 in.; outer sleeve OD, 3.375 to 25.5 in.; width of sleeve, 0.822 to 4.515 in.; inner sleeve OD 1,437 to 12 in.; outer sleeve bore, 2.875 to 23.03 in.

Rated load capacities at 10 rpm are 10,750 to 1,170,000 lb.

Rollway Bearing Co, Inc, Seymour St, Syracuse, NY



SNYDER SPECIAL

17-STATION, AUTOMATIC LINE TRANSFER
WITH OVERHEAD INDEX
MILLS, DRILLS, CORE-DRILLS, SPOT-FACES
REAMS AND TAPS
320 EXHAUST MANIFOLDS AN HOUR
AT 80% EFFICIENCY

SNYDER

TOOL & ENGINEERING COMPANY
3400 E. Lafayette, Detroit 7, Michigan
29 Years of Successful Cooperation with Leading American Industries

L & R Drying Chamber Improved for Safety

Drying chamber incorporates thermostat and specially tempered glass jars. Thermostat cuts off current to heating unit if fan motor stops functioning. The 1½-gal. jars now made of specially tempered glass withstand rough treatment and handling with less chance of breakage. Other features include special 10:1 ratio ball-bearing gear-reduction motor and splash pans which prevent spilled solutions from affecting wiring.

Machine is 23x16½x17¼ in. and Monel-mesh work basket, 5½-in. ID and 3⅛ in. deep, accommodates triple nesting baskets for segregation of small parts. Centrifugal action keeps parts stationary to prevent damage.

Efficiency features include: self-aligning column which automatically positions basket; side and bottom jar baffles to prevent solution vortex; rheostat-controlled speed; reversing action for more effective cleaning; cast-aluminum base and monel-mesh air filter under drying chamber. Price of complete machine is $262.50.

L & R Mfg Co, 577 Elm St, Arlington NJ

Electro-Chemical Marking

Crown E-Z Mark Etcher was designed for production marking or individual identification. It consists of power unit and separate tray attachment, reportedly offering economical method for etching most metals, including aluminum. Power unit has minimum of complicating switches and no complex meters to read. Provision is made for maximum power control to prevent burning out the power unit.

Tray attachment is stainless steel enclosed in compact case provided with self-contained cover. High grade stencils and fluids for marking all metals, including aluminum, are handy polyethylene containers.

Crown Industrial Products Co, 915 Amsterdam St, Woodstock, Ill

Three Models of Aronson Turning Roll

TracTred Turning Roll is available in three basic models, T1 with single strand Trac, T2 with double strand Trac, and T3 with triple strand Trac in both idler and power units. Medium of support for cylindrical pieces is roller chain sling, cradling work. This allows equipping Idler Roll with brass feet to conduct weld ground current from workpiece through Trac and into fixed idler chassis.

Current carrying capacity has been tested safe at 600 amp for T1, 1000 amp for T2, and 1500 amp for T3.

TracTred is reported to handle thin-walled cylinders without denting or cavitation. Units are equipped with rubber feet to enable user to turn out-of-balance work smoothly enough for most critical automatic welding.

Rotational speed is zero to 100 ipm, precision speed controlled to within 0.3 ipm. Electrical control is by magnetic reversing starter, dust-tight, oil-tight remote pushbutton station. Load capacities are 6,000, 12,000 and 18,000 lb, respectively, with diameter ranges of 4-10, 6-12, 8-14, and 10-16 ft.

Aronson Machine Co, Arcade, N Y

Valve Coupling Assures Tight Swivel Seal

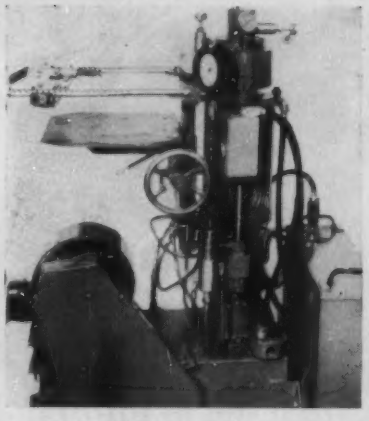
Valve coupling gives operator complete and safe control of air line at any point between compressor and air-operated device.

Nose piece of jaw half of coupling is provided with 0-ring held in machined groove. When coupling is connected, the nose piece slides into the recess of connection half of coupling. Joint is tightly sealed by internal fluid pressure acting on the 0-ring, but two valves are able to swivel freely without leakage, the manufacturer states.

Valve half of coupling which is always connected to live air supply line, is also provided with locking jaws and brass sleeve. Sleeve can be moved back and forth over hollow radially ported stainless steel body. After jaws are closed around connection half, sleeve can be advanced under overhang to lock jaws in closed position.

Couplings are available in ¼ to ¾-in. sizes with hose, male or female pipe threads, and can be used with air supply to 250 psi.

C H Hunt & Son, Inc, Salem, Ohio



Wax Injection Press for Pattern Reproduction

Wax injection press Model WP-24 has wide pressure range to 1000 psi and increased capacity to 138 cu in. per shot. Wax temperature is kept under separate thermostatic controls at the nozzle, in the pressure cylinder, and in the reserve cylinder holding tank.

Press was developed from earlier Sherwood model and retains basic principle. This is use of hydraulic pressure ram to force wax from movable cylinder through injection nozzle at controlled temperatures and pressure.

Replacement of empty cylinders is easily and quickly accomplished. Press is also equipped with die-holding table and die-positioning clamp. Reserve wax cylinder tank holds 4 cylinders.

Alexander Saunders & Co, 95 Bedford St, New York 14, NY

The Answer

To your metal turning cost problem may well be this 11" Logan Lathe *

*One of the many in the complete Logan Line of 9", 10", 11" and 12" swing Lathes, and 8" Shapers.

No. 1955 — Quick Change Gear Lathe . . . 1" Collet . . . 1⅜" Spindle Hole . . . 24" between centers. **$815.00** F.O.B. Chicago.

No. 1925—Same Lathe as above on 3-Drawer Cabinet Base, **$875.00** F.O.B. Chicago.

The cost of precision results drops sharply when you turn work on this 11" swing Logan "1955". You will be surprised, too, at how much of your work this compact lathe can handle. With 1" collet capacity, 1⅜" bore, and 24" centers it takes a lot of pressure off costly-to-run, big lathes . . . with no difference in precision results.

Sustained accuracy and low cost performance are built into this modern Logan Lathe. The spindle revolves on preloaded *ball* bearings of extreme precision that need no adjustment for any speed in the full range of 45 to 1500 rpm. The rugged, balanced special alloy bed has two V-ways and two flat ways precision ground. The automatic apron, double-walled and friction-free, with spline-driven power cross feed, has a convenient, lever-operated, disc type clutch. The modern V-belt drive transmits maximum power to the headstock. You will find the 1955 equally effective in production, shop and toolroom. Ask your Logan Lathe dealer for full facts.

Brief Facts

Collet Capacity, 1"

Spindle Hole, 1⅜"

Swing over bed, 11⅛"

Center Distance, 24"

Bed Width, 6 15/16"

Ball Bearing Spindle

16 Spindle Speeds, 45 to 1500 rpm

Double V-belt Drive for extra power to spindle is completely enclosed

Threads—48 selections, RH or LH—4 to 224 per inch

Write for the Logan Lathe Catalog

Logan ENGINEERING CO.

Lawrence and Lamon Avenues, Chicago 30, Illinois

LOOK TO **Logan** *FOR BETTER LATHES AND SHAPERS*

Drill and Tap Stand With Tap Guides

3-I-Q tap and drill stand made of die-cast metal provides indexed place for 15 popular-size drills and taps and is furnished with 9 precision-made tap guides and self-tension tap guide body, to assure proper alignment and tap starting. Fingertip selection of proper tap and drill is assured; provision is made for wide range of NC, NF, and two pipe sizes, with place for center punch. Stand is 3½x7½x2 in. in size and weighs 2 lb.

M-M-A, Inc, Lancaster, Pa

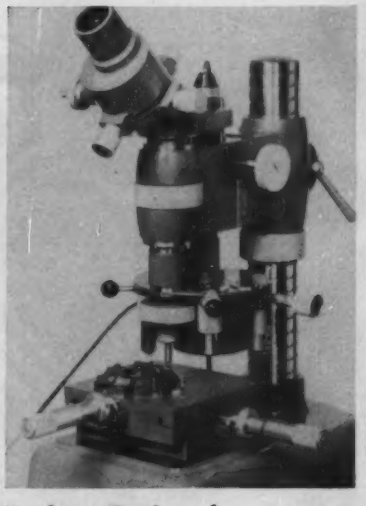
Sump Tank Cleaning Machine

Portable sump tank cleaning machine will clean chips, abrasives, sludge, old oil and coolant from sump tanks of grinders, lathes, and other machine tools. Will clean the oil and return it to the sump. Designed around Carnes vacuum method of sump-tank cleaning, machine drains sumps by high vacuum. Nothing but air passes through pump.

Oil is removed from sump and cleaned at rate of 20 gpm with average weight oils. It is passed through centrifugal sludge basket with fabric filter bag liner. Centrifugal sludge basket speeds filtration of heavier mineral base cutting oils.

This Series NS is made in tank capacities of 100 to 150 gal. Removable sludge basket fitted with replaceable fabric filter bag has capacity of 100 lb. Pumping unit consists of a vacuum pump driven by a ½-hp electric motor with full automatic controls.

W R Carnes Co, South Main St, Verona, Wis



Hardness Testing of Small Finished Parts

Hardness testing instrument is said to make only the most minute scratches or impressions which cannot be seen with the naked eye. It is a portable bench instrument with exclusive design combining positive control, diamond penetrating action with high power microscope of 400X. Microscope is swung directly over impression to read hardness by measuring with a reticle scale and vernier in 0.0005 mm, resulting in hardness readings of unusual precision in half a micron.

Coarse impressions, such as Brinell ball test, may be measured—a coordinate measuring stage, such as found on toolmakers' microscopes, is provided.

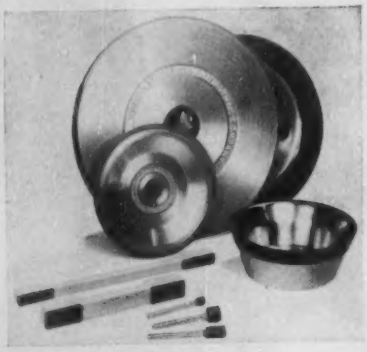
George Scherr Co, Inc, 200 Lafayette St, New York 12, NY

Palmgren Drillpress Vise

Palmgren No. 300 drillpress vise has 3-in.-wide jaws, with 3-in. opening and 1¾-in. depth. Fixture has removable steel jaw plates, and heavy Acme thread adjusting screw. Machined slots are provided on either side to aid in clamping to machine table.

Recommended for use on drillpresses, milling machines, and grinders, vise is machined square on all sides and may be turned on either side, end, or upside down for special operations.

Chicago Tool & Engrg Co, 8383 S Chicago Ave, Chicago 17, Ill

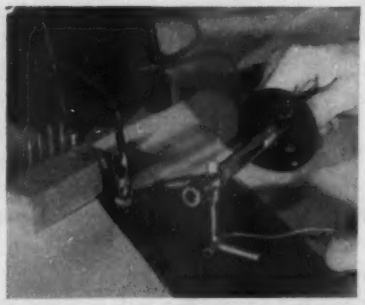


Resinoid Bond Grips Diamonds in Wheels

Pressurelock-224 resinoid material is available in all diamond wheels made by company. Bond is said to be much better than others, does not smear, and holds wheel shape, allowing faster, longer cutting.

Material has been pre-market tested for months with reported top results.

U S Diamond Wheel Co, Aurora, Ill



Low-Voltage Solderer Heats on Contact

Lorsol spot soldering tool heats instantly when tip contacts work, shuts off when removed; has no shock hazard because of low voltage.

Six heats are available from transformer. Two angled carbon tips can be operated in addition to end fitting; tips are machined for the job being handled. Carbons are in three sizes; 3/16, ¼, and 5/16 in.

Imported by Newage International, Inc, 235 E 42nd St, New York 17, NY

DE VLIEG OF DETROIT
... is proud to reproduce this unsolicited advertisement by American Type Founders as it appeared in nationally circulated technical magazines.

This ad is reproduced through the courtesy of AMERICAN TYPE FOUNDERS

This machine hunts for—and finds—dead center!

This De Vlieg Jigmil is used to locate and bore the cylinder, gear-driven ink rollers, and gear bearing holes in ATF Chief frames.

Once the adjustments have been set, the Jigmil automatically positions every subsequent frame by moving its machine table or spindle head until the desired center is located to within 3-5/10,000ths of an inch. Then this 12-ton precision borer is micrometer-set so accurately that it will remove a pencil mark from a boring without cutting the metal.

Bearing holes not so accurately located on the press frame could easily throw cylinders out of parallel, cause excessive wear to precision gears, make smooth high-speed operation impossible and take years off the productive life of a press.

That's what we mean when we talk about the precision engineering that goes into an ATF Chief. You won't find more accurate borings in any press regardless of price. It's like getting Cadillac construction for Chevrolet prices.

It will pay you well, next time you're in the market for a small offset press, to ask for the full story on the precision-engineered ATF Chief. Write AMERICAN TYPE FOUNDERS, *a subsidiary of Daystrom, Inc.*, 200 Elmora Avenue, Elizabeth, New Jersey.

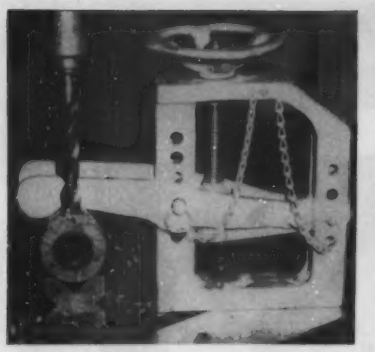
Better, More Profitable Printing from the Widest Line of Processes

GRAVURE . . . LETTERPRESS . . . OFFSET

***Come to Detroit . . .* SEE A PRACTICAL DEMONSTRATION OF "JIGLESS BORING"**

DE VLIEG MACHINE COMPANY • 450 Fair Ave., Ferndale • Detroit 20, Michigan

A request on your company letterhead will bring a copy of our comprehensive illustrated catalog.

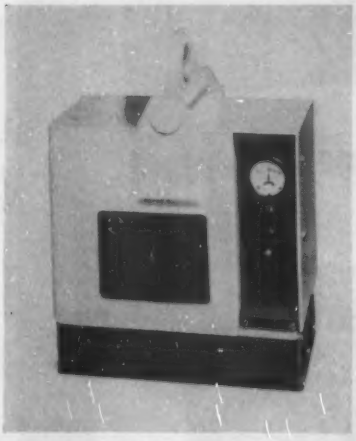


Safety Adjustable Hold-Down Clamp

Safety-Adjustable-Hold-Down clamp is said to feature savings in setup time, affording flexibility with greater speed, and to incorporate new and patented safety features. The unit gives 8,000 psi equalized pressure with compound leverage.

Clamp simply attaches to T-slot table, adjustable pins are set, work inserted, and the leverage wheel turned. Illustrated is 12-in. model designed for heavy-duty industrial production, selling for $45. A 6-in. and 4-in. model will soon be marketed.

Safety-Adjustable-Hold-Down Clamp Co, 600 Albany St, Brunswick, Ga

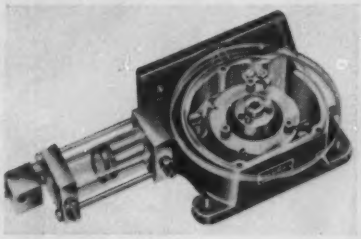


Sundstrand Lift Magnet Is Battery Operated

Lift magnet is said to be ideal for lifting in machining department and assembly department and for hauling from one department to another. Unit is powered by common 6-v automobile battery and can lift 2000 lb of finished mild steel. Operation requires only turning switch, eliminating cumbersome chain or rope hitches and eyebolts. There are no attached cords or wires to restrict length of haul. Recessed control panel contains an operating switch, a dial to indicate the need of recharging, and receptacle for a trickle charger plug.

A 4-amp battery charger for recharging a rundown battery is available as extra equipment. It can be plugged into any 110-v electrical outlet. The lift has a magnetizing surface of 7x12½ in. and the height of the entire unit is 12½ in. Weight is 120 lb.

Sundstrand Magnetic Products Co, Div Sundstrand Machine Tool Co, 1020 Ninth St, Rockford, Ill

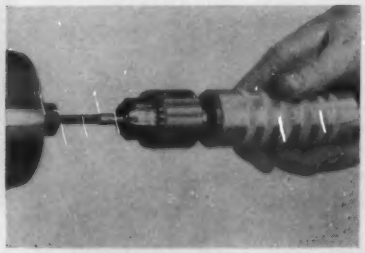


Indexing Tables Mount Two Ways

Model 725-F indexing table with 4, 6, 8, 12, or 24 positions can be mounted horizontally or vertically, and is guaranteed accurate within two thousandths at the OD of the 7¼-in. top table.

This is a smaller model with the same positive-lock features as the larger models, and is intended for cramped quarters. Compressed air is available at table top center for operating collets, clamps, or chucks. Model 725-FA has no controls, while 725-FB is equipped for automatic operation.

A K Allen Co, 57 Meserole Ave, Brooklyn 22, NY



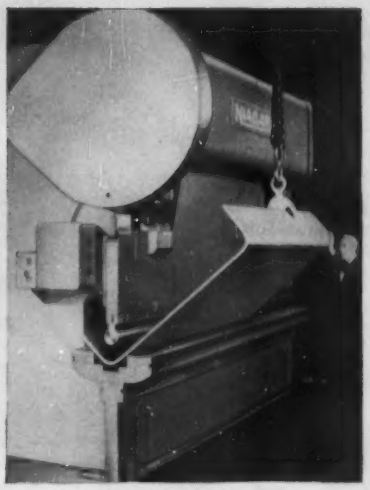
Tap and Die Holder For Lathe Tailstock

Designed for high-speed tap and die production on any lathe, quick-stop reversible holder is inserted in tailstock and can be brought to instant stop by releasing hold on tool until lathe is brought to stop. It freewheels on its ½-in. shaft held in tailstock.

Tool consists of No. 30 Jacobs chuck and arbor, 0 to 5/16 in. and special ½-in. shaft for mounting. One end of holder takes 13/16-OD button die. Jacobs chuck and arbor can be replaced with 1-in.-OD button die on other end. Only when operator grips shank or holder does tap or die operate.

Holder is made of aluminum, anodized and intermittently knurled for comfortable grip. Two setscrews in each end of holder lock chuck and dies. Advantage of this tool is reported to be in the high speed of its operation and positive quick stop.

Cobb Precision Co, 1042 N Cole Ave, Hollywood 38, Calif



Press Brakes Adapted To Many Operations

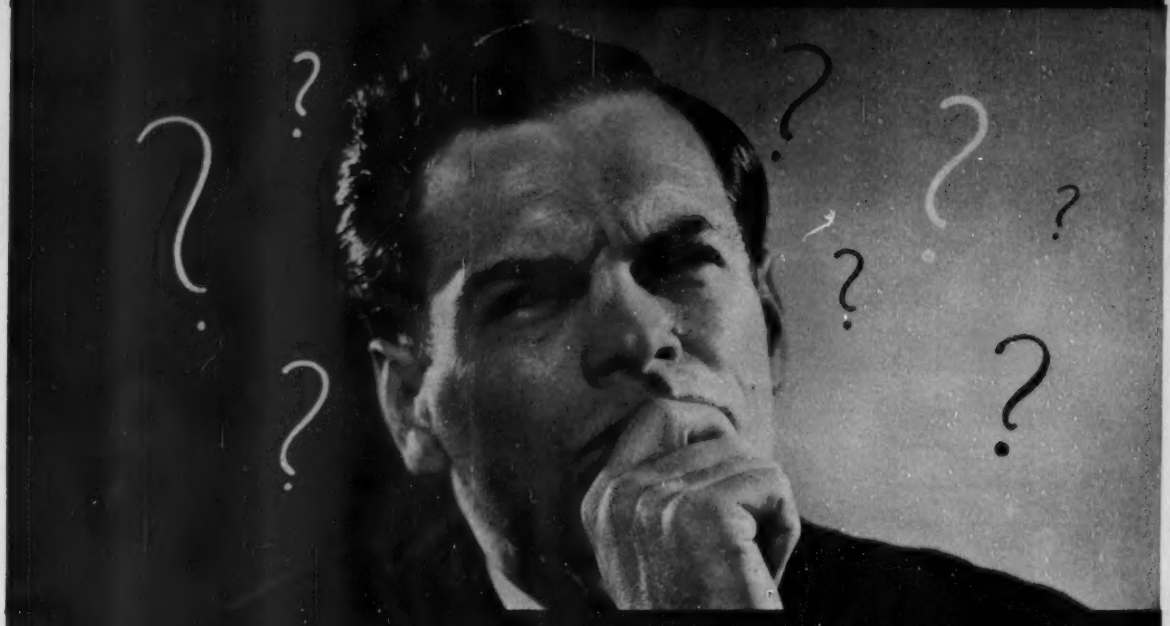
Newly designed line of press brakes is reported to be practically limitless in scope of forming, bending, punching, blanking, and related operations. To assure uniform bends with straight-edge accuracy, double-end twin drives with double reduction gearing provide constant application of power. Rugged frames feature box-type crowns to provide maximum resistance to deflection and permanent alignment of bearings and ram.

Laminated non-metallic ways reduce wear to a minimum. All gearing is totally enclosed in sealed oil baths.

Extensive line of brake dies is available for use with each of the models in the complete 50 to 775-ton press brake line. Additional information is contained in manufacturer's bulletin 89C.

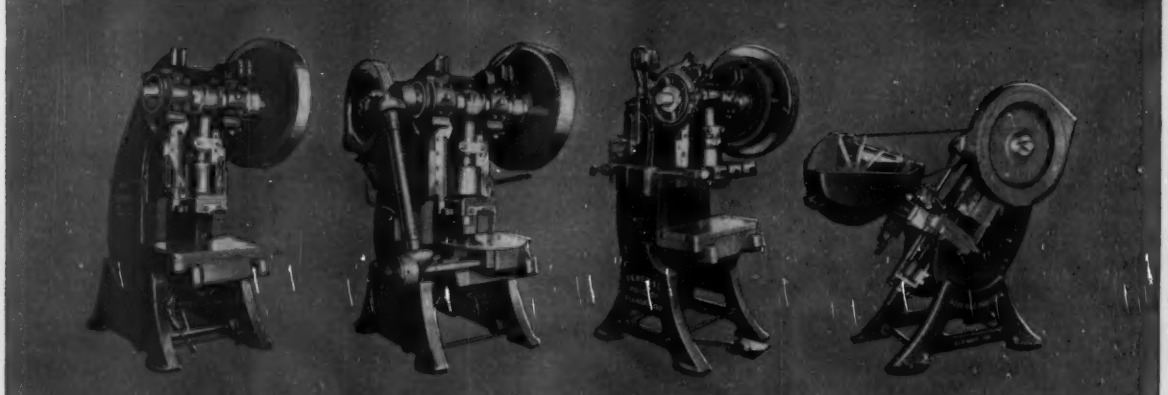
Niagara Machine and Tool Works, 683 Northland Avenue, Buffalo 11, NY

GOT PRESSROOM PROBLEMS?



Solve 'em with

FEDERAL *Open back Inclinable* PRESSES



STANDARD

Open back. Safe, front-operated recline. Non-repeat clutch. 18 to 80 ton capacities — geared and flywheel types.

DIAL FEED

Fast, accurate handling of many operations. Automatic safety stop. 18 to 80 ton capacities —geared and flywheel types.

HIGH SPEED

Air clutch with electro-pneumatic controls. Finger-tip starting and stopping. Available in 18 to 80 ton capacities.

SPECIAL

Capscrew, bolt trimming and extruding press. Available in 26 to 65 ton sizes. Special presses for automatic roll or pinch feeds.

Write for New Catalog No. 13 / **THE FEDERAL PRESS COMPANY,**

McCaskey Control of Work-in-Process used by Strom Steel Ball Co., Cicero, Illinois, largest independent manufacturer of steel balls.

McCaskey Inventory Control of finished stock.

McCASKEY Systems control PRODUCTION and INVENTORY with mininum clerical work for STROM STEEL BALL CO.

Strom controls work in process and finished stock with two McCaskey installations, briefly described by Kenneth E. Swanson, Industrial Engineer.

The first gives the Production Manager *at a glance* all the facts he needs to control production and process inventory of hundreds of types and sizes of steel balls by size and departments. Among them are:

(a) units produced by each department against schedule;
(b) location and amount of all process inventory;
(c) sizes or departments behind schedule, requiring corrective action;
(d) bottlenecks, if any, in flow of production;
(e) inventory banks to be increased or decreased.

McCaskey Inventory Control of all material in finished goods stock replaced a machine-posted system several months ago. The Sales Department must have dependable data on units available at all times to make definite commitments for shipments from stock. McCaskey provides this accurate, *up-to-date* information.

McCaskey Controls quickly return their first cost in improved operations, time and effort saving. They require a minimum of clerical work. Mail coupon for complete information.

MAIL COUPON FOR COMPLETE INFORMATION

McCASKEY REGISTER DIVISION
Victor Adding Machine Company
ALLIANCE, OHIO

Please send me complete facts on: McCaskey Production Control ☐; Inventory Control ☐.

Name .....
Position .....
Company .....
Address AM-8-2-54

McCaskey
INDUSTRIAL CONTROLS
PRODUCTION - INVENTORY
TOOLS - MAINTENANCE - COSTS
THE McCASKEY REGISTER DIV.
Victor Adding Machine Co.
ALLIANCE, OHIO
Galt, Canada ..... Watford, England

ROUND TABLE Discussion

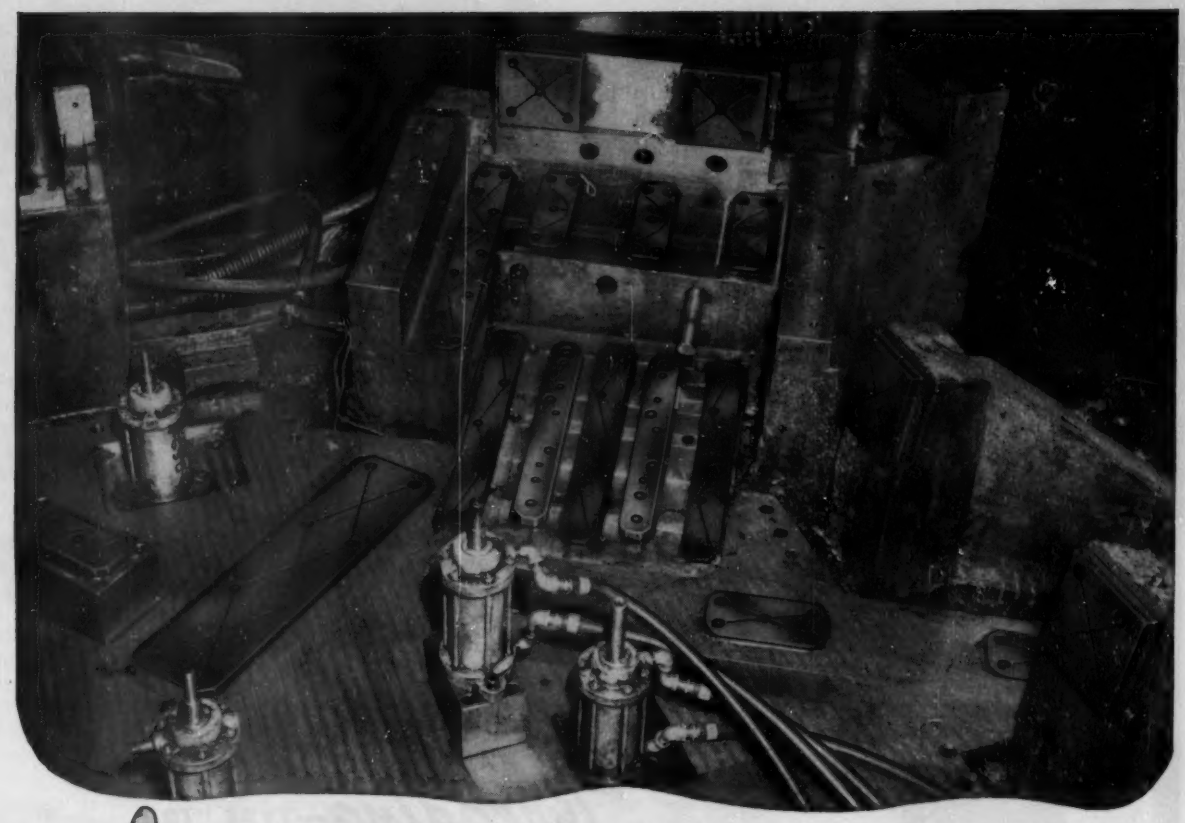
CO-OP LOOT

Does profit sharing tend to increase the individual worker's interest in production output? If so, what sort of plan works best? Will the men accept the fact that every year is not a profit year?

NO ONE THAT I can think of objects very strenuously to receiving a bonus check along with the regular stipend, anymore than the treasurer of a company hates to get up at the annual meeting and admit to the stockholders that due to increased production the company will have to declare an extra dividend. We are all human enough to expect that the people we work for, at the close of a prosperous year, will have something more tangible to offer than the season's greetings and a hearty handshake.

Quite a number of progressive companies have gone further than merely setting aside a certain sum for seasonal giving. They have recognized the fact that profit sharing pays off on a year-round basis, not only on dollars and cents, but in employee goodwill, and an absence of labor trouble, as well as absenteeism. Of course, these profit-sharing enterprises were not set up overnight; it took considerable study and much time for discussion before a plan was evolved that met with the approval of management, employees, and stockholders.

Any profit-sharing plan obviously must be tailored to fit the company involved, and should also take into consideration the type of industry with which the company is concerned. If it is of the seasonal variety, the plan must be flexible



THEY'RE OK HERE

. . . long wearing, economical OK aluminum bronze wear plates

Practically every important automobile manufacturer now uses OK aluminum bronze wear plates on body dies.

By a unique cladding process, long-wearing aluminum bronze is bonded to a machinable steel base. Cost is drastically lower when compared to solid cast bronze plates. A finer quality bearing surface is obtained, resulting in longer life. When fitting is required to suit die, steel backing of plate is easily machinable, and no difficulty is encountered drilling or counter boring through bronze surface. OK aluminum bronze plates are applicable wherever a die has a sliding or cam action. A large selection of sizes of OK aluminum bronze plates is *carried in stock* . . . finished ground, flat and parallel . . . ready to ship. Simply send your drawings or sketches to our engineering department.

Manufacturers for the metalworking industry of:
SLITTER KNIVES • SHEAR BLADES • BRONZE WAYS ROTARY SHEAR KNIVES • HARDENED SPACERS • BALL RACES • HARDENED WAYS • WEAR STRIPS • GIBS

Dept. 12-W

THE OHIO KNIFE CO.

CINCINNATI 23, OHIO

SNOW MANUFACTURING COMPANY

455 EASTERN AVENUE • BELLWOOD, ILLINOIS

FULL UNIVERSAL
MACHINES
Electrically Operated—Air Controlled

. . . Drilling—TYPE "UD"

Capacities from #60 through ⅜" in two sizes

. . . Tapping—TYPE "UT"

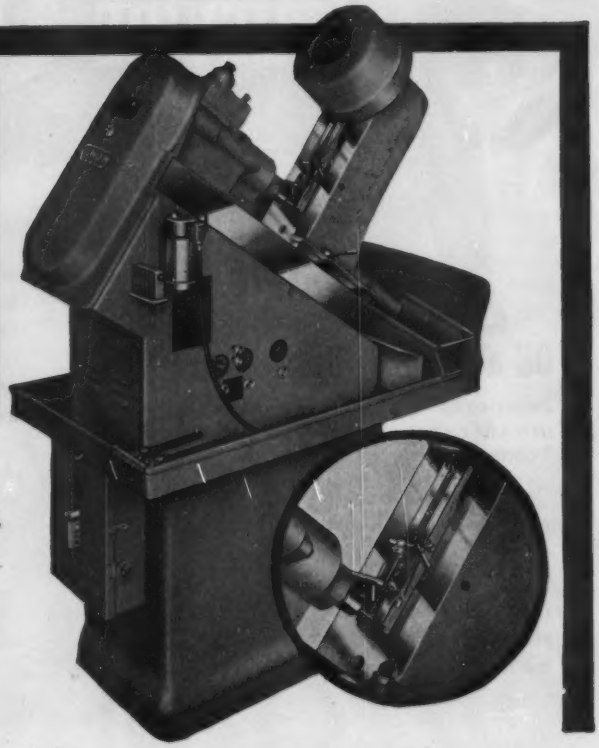
Capacities from #0 through ¾" in four sizes

. . . Threading—TYPE "TR"

Capacities up to 1" in two sizes

AUTOMATIC and SEMI-AUTOMATIC
JIGS and FIXTURES
for Indexing and Clamping

A complete line of basic Master Fixtures to permit adaptation of a wide range of parts at high production rate with low tooling cost.



FULL AUTOMATIC
Nut Tapping Machines

Completely automatic hopper feed nut tapping machines up to ⅜"—incorporating simplicity and low tooling cost. Standard taps are used. Precision class 3 and 4 fits and parallelism maintained at high speed and high production.

enough to recognize and adjust itself to the conditions involved more readily than the industry whose business sights can be set at a longer range.

Assuming that our friends Al and Ed are connected with an industry and a company of the long-range variety whose efforts are centered on one particular product, I am inclined to believe that sharing the profits on an over-all company basis is preferable to rating each department as a single unit.

On the other hand, if the company has a diversified line of products and one product is in greater demand than another, throwing an extra workload on the department chiefly responsible for the production of the more popular product, then I would say that the personnel of this particular department would be fairly entitled to a little more of the profit than other departments whose workload hadn't been quite so strenuous. In other words, they would be entitled to the over-all company share, plus a percentage of the amount earned by the more popular item.

However, whether the "loot" is divided on an overall basis or a departmental unit deal, I am of the opinion that the division should take into consideration the degree of responsibility required in each individual job and share the profits accordingly, basing the remuneration on a percentage of an employee's salary or hourly rate.

Ed's idea of a general increase in pay, in my opinion, doesn't merit serious consideration. Should the company run into difficulties, the employees wouldn't like the idea of a pay-cut to meet competition. On the other hand, if they understood their bonus at the end of the month was in jeopardy, they would be more inclined to put forth extra effort.

Robert S Alexander
Glastonbury, Conn

"I hate to interrupt your trend of thought, Mr James, but I think some of the other operators are waiting to have their setups okayed!"

ACCO Registered* WIRE ROPE SLINGS

A STANDARD OF QUALITY

●"ACCO *Registered*" is the registered trademark applied by American Chain and Cable Company to slings of the highest grade, but it is more than just a trademark.

"ACCO *Registered*" is a definite specification of quality in both material and design.

To be "ACCO *Registered*," a wire rope sling must meet the following specifications:

1. **It must be made from high strength "Green Strand" wire rope.**
2. **All parts of the finished sling must have a breaking strength equal to the catalog strength of the sling body.**
3. **All fittings and attachments must withstand a proof-test equal to at least two times the rated capacity without permanent distortion.**
4. **Actual field service tests of each design.**

As evidence of compliance with these requirements each sling is given a metal identification tag and is accompanied by a Certificate of Proof Test and Registry.

What does ACCO REGISTRY mean to you?

It means that you can equip your shop with "lifting tools" and be confident that their designs and materials are specifically selected for the highest efficiency by trained engineers who spend all their time on slings.

It means that you can be sure that your men, materials, and machines are given the highest protection against injury during lifting operations.

Where can you get ACCO REGISTERED SLINGS?

To make ACCO *Registered* Slings immediately available for your requirements, American Chain and Cable Company, Inc. has appointed one of the best industrial supply houses in your community as an ACCO *Registered* Sling distributor. Selection for such appointment is made on the basis of the distributor's desire to serve you, his grasp of your problems, and his willingness to maintain in his stock sizes and types of slings you need.

See your ACCO *Registered* Distributor or write to us for literature and his name.

*Trademark Registered

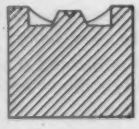
ACCO Wire Rope Sling Department
AMERICAN CHAIN & CABLE

Wilkes-Barre, Pa., Atlanta, Ga., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Bridgeport, Conn. In Canada: Dominion Chain Company, Ltd., Niagara Falls, Ont.

COUNTERBORE
LASTS $3\frac{1}{2}$ TIMES
ESTIMATED
LIFE

...an example of cost reduction through W&S tool design...

A single ¾"-diameter counterbore designed by Woodruff & Stokes has recently machined its 35-thousandth close-tolerance hole on the round surface of B1113 cold-rolled-steel machine-gun bolts. Under the rigid tool tolerances of ±.0005" and ±10 min., the expected life of these counterbores was 10,000 pieces before sharpening.



A look at the profile of the intricate hole machined by this W&S counterbore is a look at Woodruff & Stokes' specialty—designing and producing small precision tools to do *in a single operation* work often requiring many separate machinings with their attendant loss in accuracy and time.

You can cut production costs by using W&S cutting tools designed to your own product requirements. Investigate—write Woodruff & Stokes Co., Inc., 345 Lincoln Street, Hingham, Mass.

ABOUT TWO YEARS AGO I was called in as a witness in a law suit where the buyer of a machine shop claimed that the seller, before he turned the firm over, had paid a bonus to his employees at the end of the year and thereby brought about a great loss to the buyer.

At court I said there are many reasons to believe that profit-sharing plans not only result in higher production, which will pay for the extra money received, but also that it favors the companies where such plans are in force so that their returns will be higher. My opinion is, therefore, positively in favor of some kind of profit-sharing plans.

I agree with Al that this is the best way of increasing production and saving much useful materials and tools, because the men are more careful about these things. Ed's worry that it isn't fair to give all men the same percentage because some men work harder than others, should not be taken too seriously; they'll all work hard.

Of course, any profit-sharing plan must be a matter of voluntary agreement between management and the union in each case, and there are many different types or systems of profit-sharing. Forced agreements along these lines can never be accepted; that would ruin the whole idea.

Some companies have set up such plans under complicated formulas, tied in with some philanthropic ideas, or with insurance, pension, or stock purchasing. But this is not the kind of profit-sharing the men want. A straight bonus at the end of each year is best, easiest to apply, and the men understand it.

Naturally, invested capital must yield a reasonable return, but a part of the profit above that mark may be given back to the employees as new investments, which, if the thing

"Don't get sore, Joe—Let's try it for a coupla paydays—"

here are* 10 *"reasons why" you'll be interested in

DI-ACRO* ROLLERS

1 Cam actuated idler roll—an exclusive feature—makes it possible to form small circles in one operation.

2 Larger circles are formed in two operations. No limit to maximum radius.

3 Bends are located at any point in metal—with straight sections on both sides of the bend.

4 Material other than sheet is also formed. Special rolls supplied for special forming jobs.

5 Eight models. Rated capacity to 16 gauge. Forming widths from 6" to 42".

6 Di-Acro Rollers are easy to operate.

7 Adjustments can be "locked in"—hundreds of parts precisely duplicated.

8 Long, trouble-free service, all machines backed by warranty.

9 Engineering Service at your disposal for the life of the machines.

10 Delivery is good. Cost is too.

**pronounced Die-ack-ro*

LIKE MORE INFORMATION?

Send for 32-page Catalog

Gives complete details on Di-Acro Rollers, Brakes and hand and power operated Benders, Notchers, Punch Presses, Rod Parters and Shears. Write now while the thought is still fresh in your mind. No obligation, of course.

Creators of **"DIE-LESS DUPLICATING"**

O'NEIL-IRWIN MFG. CO.
311 8th Avenue
Lake City, Minnesota

di-acro PRECISION METALWORKING MACHINES

BIG

Spur
Helical
Spur Internal
Helical Internal
Rack
Herringbone
Worm
Non-Metallic
Splines
Coniflex Bevel
Spiral Bevel
Zerol
Hypoid
Intermittent
Sprockets

or SMALL

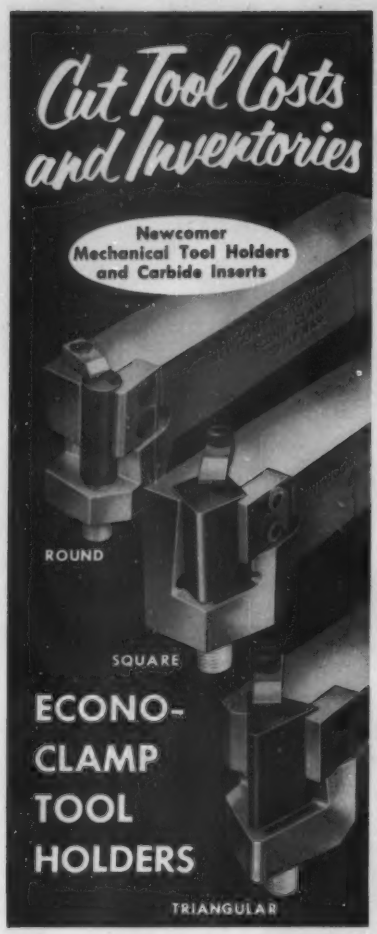
... they're all the same to PHILLIE GEAR

PHILADELPHIA GEAR WORKS, INC.

ERIE AVE. & G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA

Industrial Gears & Speed Reducers

LimiTorque Valve Controls



Newcomer Econo-Clamp Tool Holders provide a short-cut to economical production . . . machine down-time for tool grinding is minimized because multiple cutting edges on inserts can be utilized! Positive dual clamping features provide easy, quick and accurate indexing.

Econo-Clamps use standard full-length inserts or the more economical, short Newcomer "Throway" Carbide Inserts together with a hardened steel base anvil.

Newcomer Ad-Clamp Tool Holders are also available for use with standard rectangular blanks or the more durable Newcomer Step-Tip Blanks.

Send today for Newcomer Catalog 109-541

NP
CONTROLLED QUALITY CARBIDE

NEWCOMER PRODUCTS, INC.
Latrobe, Pa.
General Sales Office:
512 Franklin Ave., Pittsburgh 21, Pa.

is handled right, should give more profit. Good-will investments have many times proved to be as profitable as investments in capital goods.

In order to understand men's reactions to profit-sharing plans, perhaps it is necessary to have worked hard with one's own hands. When there is an opportunity to make some extra money any normal person will look up and take notice. Then one might ask, Why cannot that be brought about through some incentive plan instead? No, incentive plans don't have the same encouraging effect as profit-sharing plans. When doing piecework, for instance, many men hold back their effort because they are afraid prices will be cut if they earn too much. This cannot happen where profit-sharing plans are used. In such cases there is no need for keeping employees on piecework, because everybody will do his best anyway.

But the greatest obstacle to maximum production is connected with socialistic thinking. Some workers still think there are large sums of money accumulated in most companies which should be given them instead of the stockholders. Such thinking disappears when a part of the profit is divided among the employees. And here is an important addition—they'll also vote differently, politically. If profit-sharing plans were common in every country, there would be very little socialistic activities. And at least in Europe the political structure would be quite different and far more stable and dependable. Strikes and lockouts would be banned, which alone would save the world tremendous sums of money.

To handle any profit-sharing plans correctly the men should be told at the beginning what the company intended to do, and of course, never let them down. When they once have experienced a bonus, efficiency will increase without a doubt. A smoother relation between the company and the union is another advantage.

To uphold high production, employees should be informed from time to time how business is going; otherwise they might think they were not getting their share as promised. When a company has distributed a bonus for several years it doesn't have to prove that its intentions are honorable.

In any company with a profit-sharing plan labor turnover is only a fraction of the usual figure, which is an advantage of great significance.

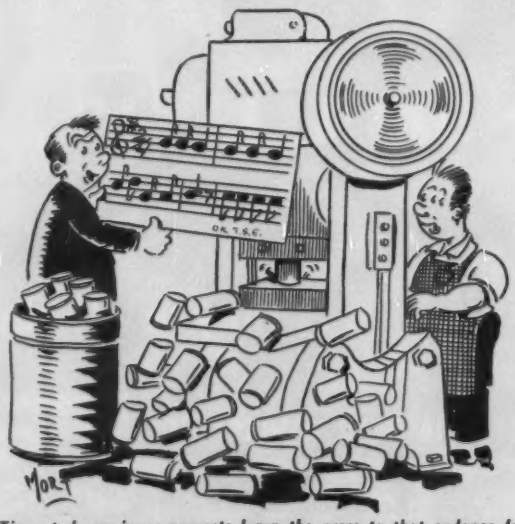
A E Fristedt
Stockholm-Bromma, Sweden

DECIMAL DITHER

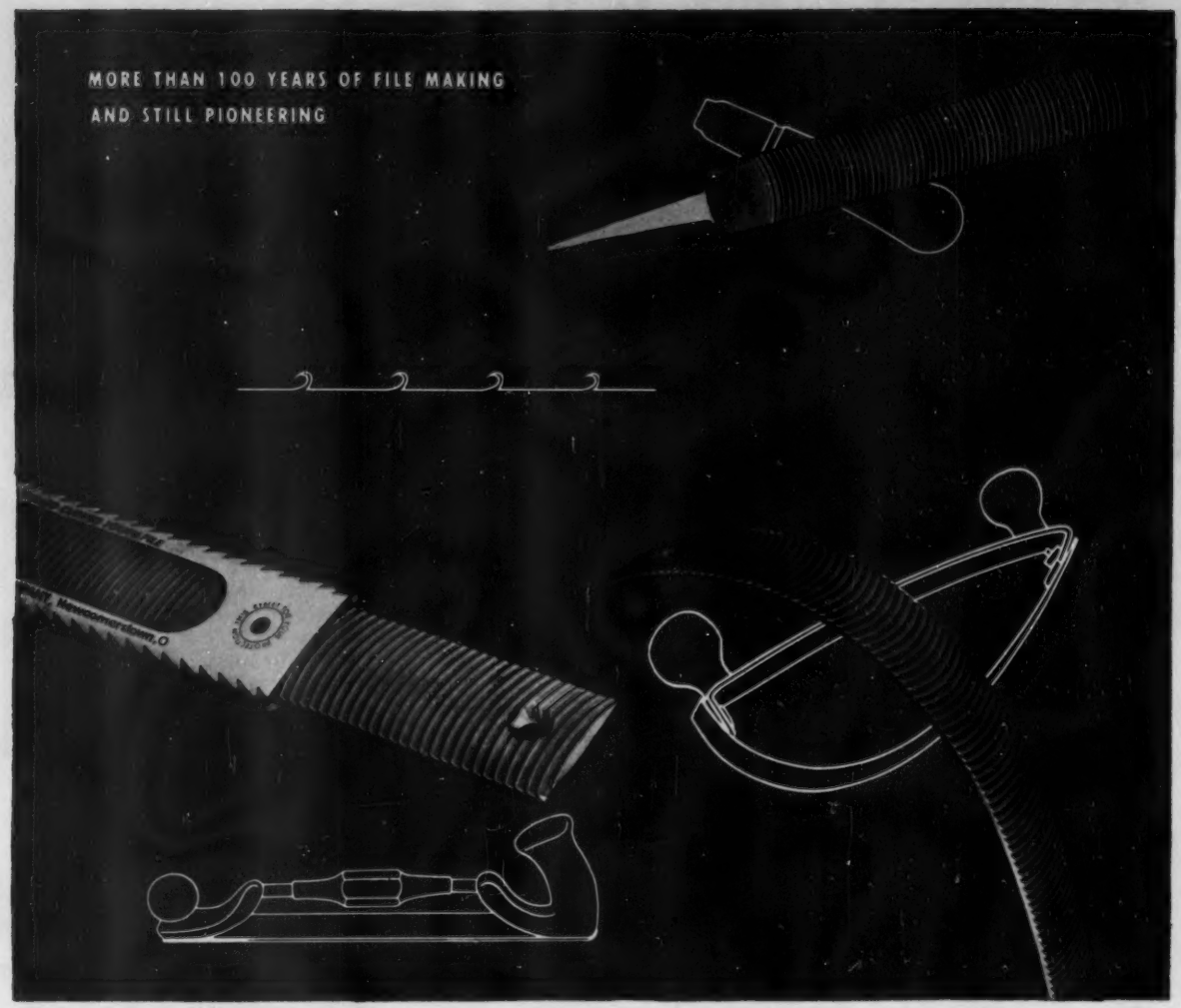
Which is easier for all-around shop use — decimals or fractions? Would the average shop man rather write or read a dimension as 33/64 in., or as 0.515625? Does the extreme accuracy of the decimal system counterbalance the familiarity of long-time use of fractions?

I was slightly astonished about the question whether inches should be sub-divided into decimals or not. In America for a considerable time the decimal sub-divisions have been in use and usually the opinion was held that the motherland of the inch system, England, was sticking to the fractions and that the engineers and mechanics would like to keep them.

The first suggestion to decimalize the inch system was made by C



"Time-study engineer suggests I run the press to that cadence for peak production."



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You can obtain these advantages with Kendex tooling: (1) Minimize downtime for tool changing; (2) Eliminate tool grinding expense; (3) Prevent temptation to "save" money by reconditioning tools that have outlived their usefulness. Ask your nearest Kennametal representative for details. Kennametal Inc., Latrobe, Pa.

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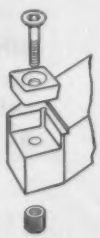
2 Kendex inserts are mounted to suitable tool holders with socket head screws.



3 When edge becomes dull, insert is turned to new cutting position. When all cutting edges have been used, insert is thrown away; no regrinding.

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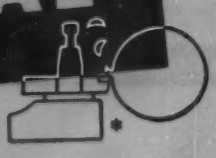


SALES OFFICES IN PRINCIPAL CITIES

Holtzapffel and probably even before, as Sir John Barton devised in 1808 a differential screw micrometer which he supposed could measure hundred thousandths of an inch. This clearly suggests a decimal subdivision and the famous Whitworth, whose screw thread system is now being abolished in favor of an international screw thread, developed a measuring machine for one millionth of an inch.

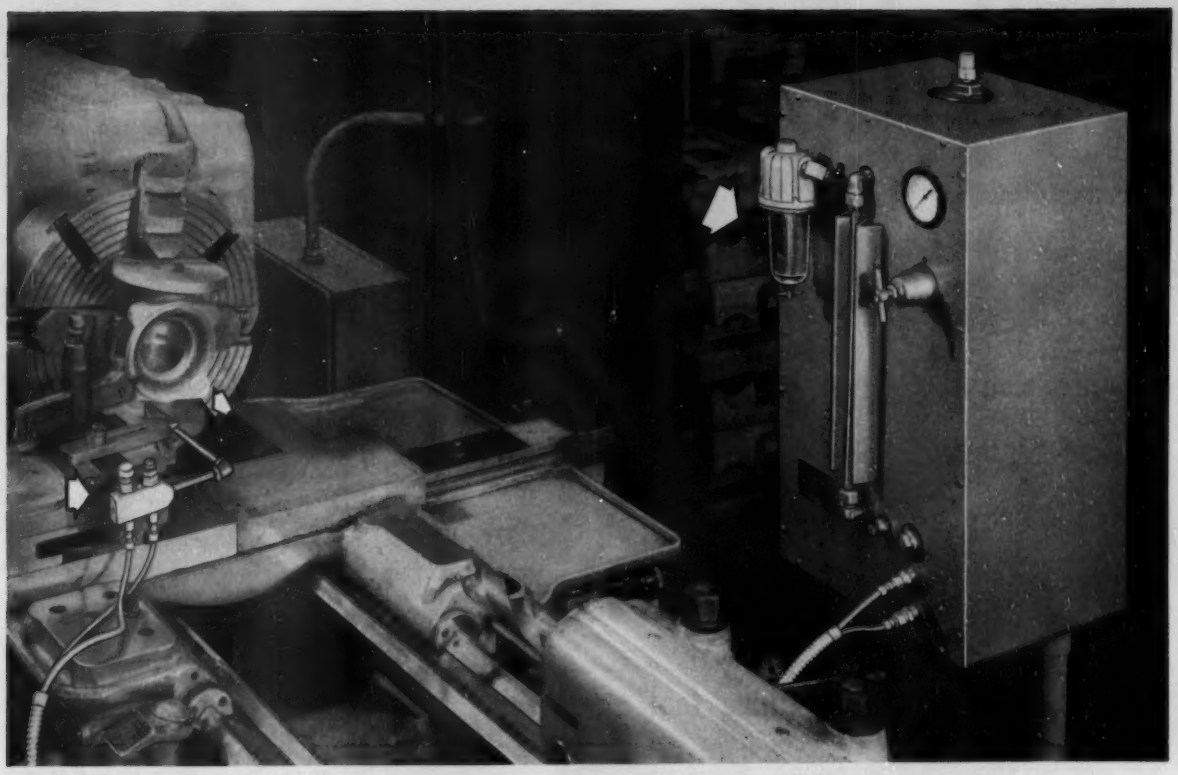
The engineering practice in this country, even fifteen or twenty years ago, was to avoid the 1/32 and 1/64 and rather to introduce decimal values in ordinary drawings. One of the oldest systems for limits and fits in use in this country, the Newall system, also knew only decimal subdivisions.

P Grodzinski
London, England

Unless a man has the decimal equivalents readily available in his memory, the first thing he does when he encounters a fraction is to glance up at a chart in order to determine the fractional value in thousands of an inch—especially if he has any calculating to do. At that, the oldtimer remains content to put up with a little inconvenience rather than to do away with a system under which he was brought up. As Ed says, it is hard for a man to change over to another type of measurements and he will do all he can to kill the idea.

The fractional system was handed down to us by our forefathers—and many old bucks beyond that—and we followed suit in using it. It is only natural for us to speak in terms of four and three-eighths, five and one-quarter, or something or other with fractional parts of an inch, whereas to describe our requirements in such terms as seven and one-hundred and fifty-six thousandths would seem decidedly out of place. Hence the habits we acquire seem to stick with

"She bumped her husband."



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Lo-Jet Cools And Lubricates

Lo-Jet ACRO is a pressurized mist system that provides both evaporative cooling of tools and work, and lubrication, to reduce friction generated heat. Because it's pressurized, Lo-Jet delivers cooling and lubrication uniformly, too, regardless of operational conditions.

Lo-Jet Pays For Itself In Reduced Costs

Lo-Jet ACRO increases tool life 100%-300%, and the resultant savings in tool cost alone soon pay for the unit. The Lo-Jet costs less to operate, too.

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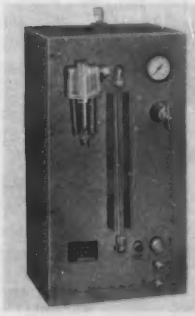

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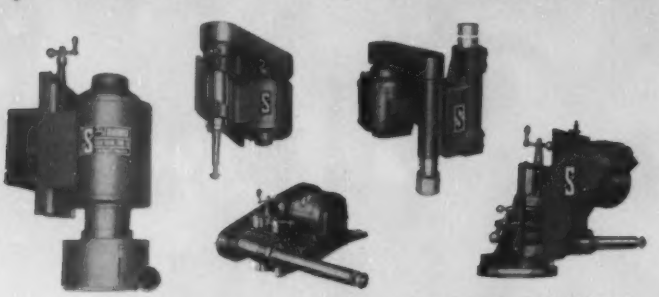

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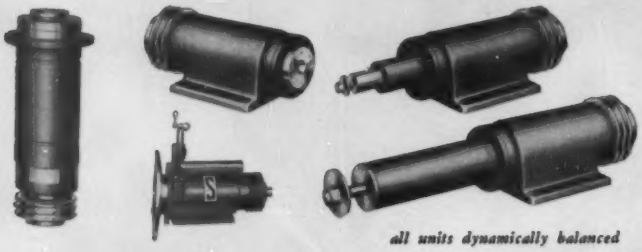

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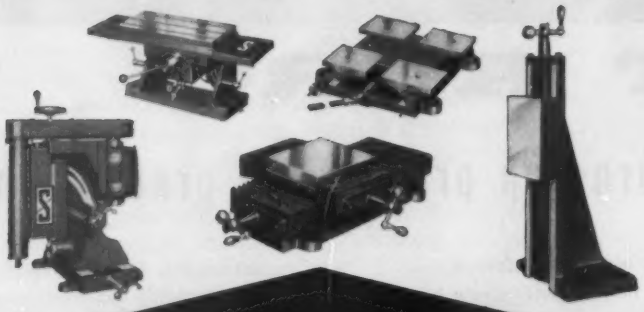

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us and we are hesitant to change to something different.

We work along with fractional scales, yet the graduating dials on our machines are in thousandths. When we read our working drawing we find it necessary to convert from the fractional to the decimal equivalent so that we can make adjustments to correspond.

The decimal system of dimensioning contributes to neatness in a drawing and, if allowed universally, would lend its influence in working facility. I came upon several prints lately that had standard tolerances printed in the title block: Two place decimals allowed thirty thousandths plus or minus — cripes and more cripes! I could work closer than that with a wooden scale whittled out with a pocket knife! Three place decimals allowed plus or minus ten thousandths. Closer tolerances must be arranged in such fashion as to give the maximum and minimum figure beyond which one could not go. This undoubtedly gives the worker something to shoot at, but from a calculating standpoint it gets rather involved in tolerance buildup.

Naturally it is going to stir up a lot of objections on the part of the oldtimers who used fractions all their lives and are hesitant to change.

Ed's going to blow his top one of these days when he comes across a drawing that informs the worker to drill a hole thusly: 0.124 dia, 0.81 deep. He's going to rubber around the shop until he comes upon a chart and he is going to let out with an exclamation something like this: "Hell's fire, that's damn near an eighth of an inch!"

Go ahead you youngsters, fight it out among you. The way I feel now I don't give a tinker's damn — I'm getting up in years and can't risk a broken nose.

Rex Warren
Waterloo, Iowa

"How do you manage to keep the men from congregating around the vending machines?"

I think our friends Al and Ed have got into one of those chicken-or-egg controversies that never will be settled to anyone's satisfaction. But when the smoke has cleared away, Al will most certainly not have thrown away his six-inch scale and torn down the shop decimal equivalent charts and Ed, though not too happy about the whole thing, will try and sell the oldtimers on the all-decimal print—despite the fact that he isn't sold on it himself!

To my mind the reluctance of most shopmen to warm up to the all-decimal blueprint is the question of education. As a not-so-old oldtimer in the machinist business I can recall when most shops confined the use of micrometers to the toolroom. The plug and ring gages were good enough for the rest of the shop if lathe work was concerned, and the feel of the calipers on the plug determined the fit of the ring gage where a shaft or pin was concerned. If a pin or bushing had to be turned for a drive fit, the operator placed a piece of thin paper over the contour of one side of the plug gage and set his outside calipers accordingly. Here again the man's sense of touch determined whether or not the drive fit turned out to be a slip fit! Contrast this with today's widespread use of precision tools whereby the average machinist is expected to own at least two pairs of mikes as well as other precision tools that once were held under strict surveillance in the toolroom. Nowadays a skilled machinist travels around with more expensive equipment than the psysician carries in his little black bag.

Which brings us back to the question of education where decimals are concerned. A great deal of the antipathy toward the all-decimal drawing stems from the fact that the school curriculum is inclined—or was inclined, till recently—to lean toward the old-fashioned measures of length as expressed in feet and inches. Particularly so as usage has imbedded them as the standard forms of measuring length in the country. We have had serious attempts to change the measuring habits of the country—just as we had to change its drinking habits—but in spite of the fact that decimal coinage has worked very well, we still cling to the yardstick of Old England.

For my own part, unless we are dealing with extremely fine tolerances, I see no great gain in dispensing with fractions on a blueprint. Most blueprints carry, or should carry, a notation to the fact that where a fractional dimension is ex-

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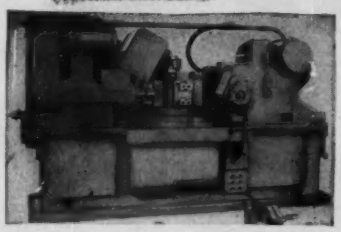

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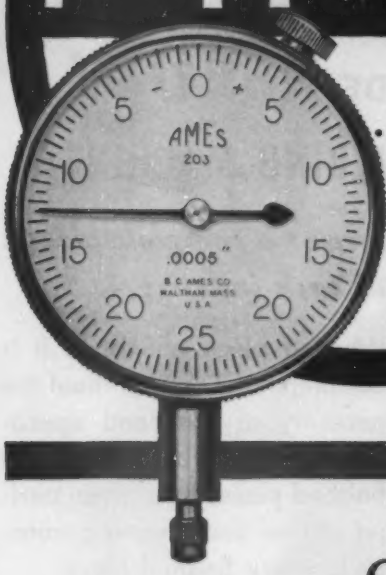

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pressed, limits of plus or minus 0.010 should be observed. A critical tolerance or dimension should always be expressed in decimals. For example, if you have a casting to machine that must line up precisely with another part you express the dimension on the print, as say, 114.625 ±000. Otherwise, if the dimension is not critical, it could be expressed simply 9 ft. 6⅝ in.

As the primary purpose of any blueprint is to impart information to the man in the shop as simply and clearly as possible, anything that has a tendency to defeat that purpose should be avoided. If Ed feels that the all-decimal blueprint is going to give his men trouble and impede production rather than increase it, he is quite right in protesting, even though the "brains" in engineering looks down their noses at him.

Robert S Alexander
Glastonbury, Conn

A decimal is an adjective; it describes numeration in tenths of a unit. One unit is ten times the next lower unit. It is a neat manner of describing quantity. No workman should go into a dither, or tremble, over being required to describe a quantity with a decimal.

Some workers have been accustomed to using fractions instead of decimals in their measurement of quantity. A change should be welcome; it is a step forward. Engineers use decimals instead of fractions. The proud will figure that what is good enough for the engineer is good enough for them.

Progress requires change for the better. Products must be constantly improved to provide more goods for more people and to create more jobs with greater job security for the worker himself. As designs improve, tolerances become closer than ever before. The concept of 0.109375 and 7/64ths is the same; the former is

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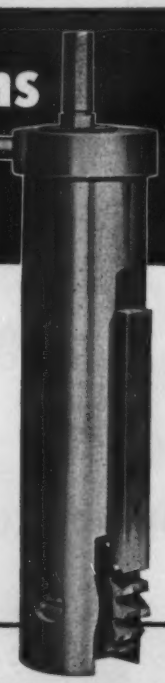

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Peter A Seward
Swampscott, Mass

I'm surprised that even Ed should question the use of decimals on drawings of anything requiring a semblance of accuracy. Of course a half-inch plug gage can be equally accurate, no matter how it is marked. But I've been so accustomed to seeing decimal dimensions of drawings for well over half a century that fractions do not seem to belong on machine work where even ordinary accuracy is required.

I have worked in shops where both "firm joint" and "spring" calipers were in common use and where either a micrometer or a vernier were almost unknown. And I have great respect for the old machinists who could make remarkably good fits with only those kinds of measuring instruments. Many of them had a very sensitive "feel" when using calipers of either kind on a shaft or in a hole.

I recall one old machinist in a railroad shop who fitted axles and wheels together. I'm not sure which caliper he used, but I think it was a firm joint. He would bore a wheel hub to fit an axle and tell you approximately the pressure it would take to press them together, and within very close limits. And here there are the variables of roundness, taper in both wheel and axle, and the kind of compound used as a lubricant. I've known them to force out an axle that went in too easily and use a heavier-bodied "dope" to

"There's where our stretcher went, Doctor."

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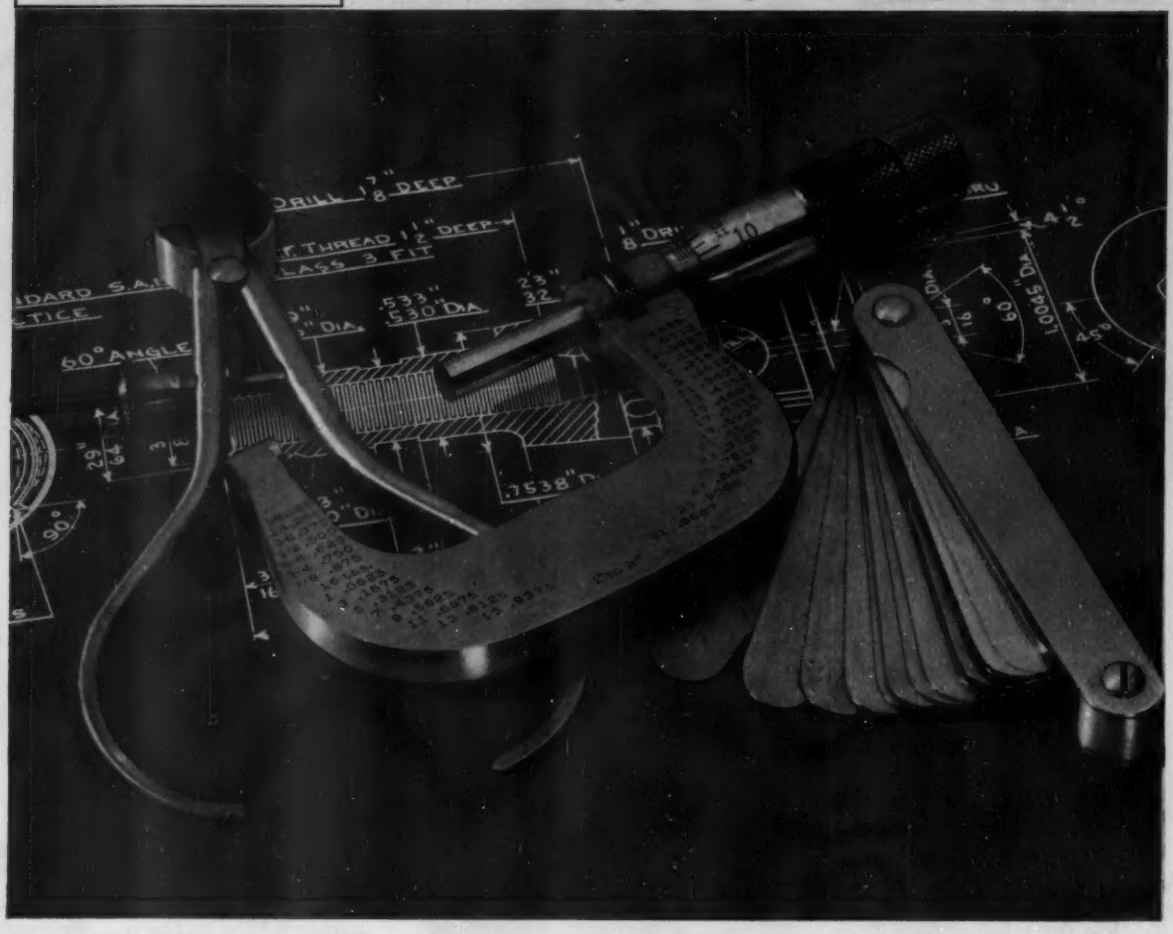

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make it show a higher pressure on the wheel press gage.

Those were the days when a "boiler-maker's hair" was a standing joke in one railroad shop, as a standarde of accuracy. The boss boilermaker had boasted that a new boiler was true "within a hair"—but which proved to be three-sixteenths out of line when finished.

We are not likely to completely abandon such fractions as halves, quarters, eighths, and sixteenths in ordinary conversation. It would be a bit awkward to speak of a ⅛-in. pipe as being "one hundred and twenty five thousandths." And we will doubtless continue to put "⅛-in. pipe" on drawings where articles are known in that way. But when we make drawings of almost any kind of a machine we find it much better to use decimals, especially where running or force fits are concerned. Trying to use fractions for pitch diameters of gear or for depth of threads would be much more confusing than decimals can possibly be.

I'm guessing that Ed's men will have little trouble in using blueprints with decimal dimensions.

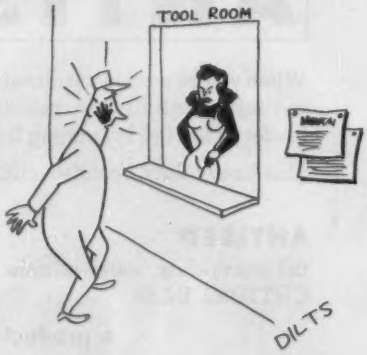
Fred H Colvin
Point Pleasant, NJ

I wish both Ed and Al could be with me in one of my Machine Shop classes in our Madison Vocational and Adult School when I get to teaching a group of beginners from these charts. If the chart maker would hold his decimals to the fourth place, I think Ed would find less confusion in using them and the men quicker to understand them.

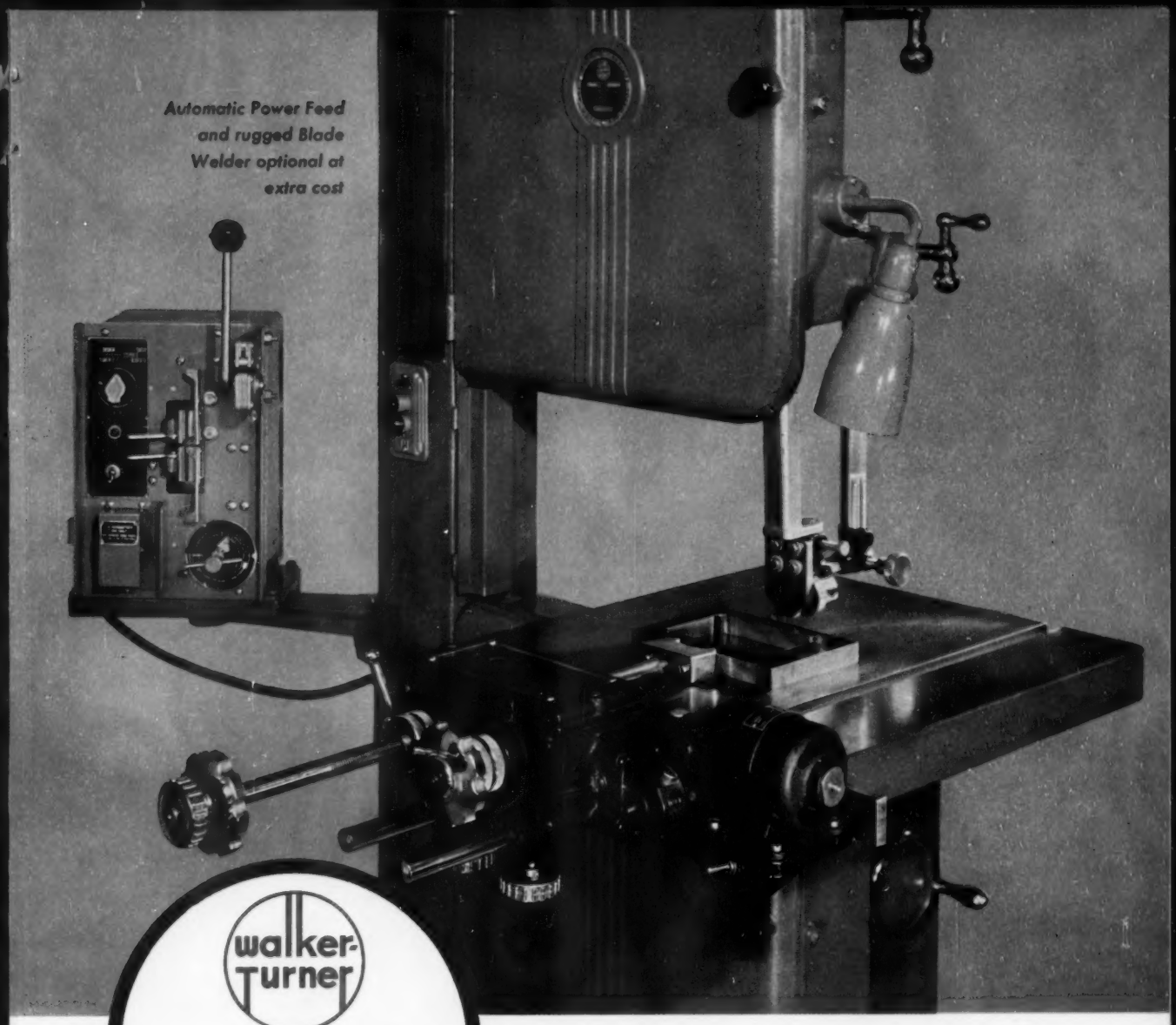
The chart that hangs in my room at this time has only four figures to the right of the point, the advertising be what it may.

I have waited a good many years for this to happen; I can't hang on forever.

Fred L Todd
Madison, Wis



"Don't you ever dare call a file that in my presence again!"



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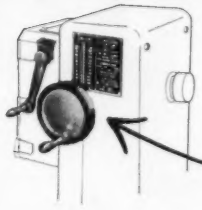

A turn of the handwheel – while the machine is running – sets blade speeds ***in stepless variation from 50 to 450 SFM in low range, or 500 to 4500 SFM in high range.*** Indicator registers exact speed.

The Walker-Turner 16" Variable Speed Band Saw cuts as you want it to cut. Always on the job, this LIGHT-HEAVYWEIGHT is easily set at exactly the right speed for any stock you work: tough steel... nonferrous metals... plastics... wood. No time lost in belt changes, no efficiency lost because of inadequate speed range. See this versatile precision tool with *Variable Speed Drive* at your Walker-Turner distributor now.

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Osborn wire brush, automatically located, removes zinc chromate from around rivet holes in aircraft production.

Which of these versatile brushes will cut your costs?

Hard-to-get-at jobs are simplified . . . costly hand operations are eliminated . . . when you switch to one of these special-purpose Osborn power brushes.

These versatile wire brushes are just a few of the complete Osborn line of power brushes for every need. Your **O**sborn **B**rushing **A**nalyst will gather necessary facts in your plant . . . study your production equipment and recommend the most efficient, economical power brushing techniques.

The small Osborn brush shown in operation enables one man to do the work of seven men. Output per man went up 700% in this aircraft application of removing zinc chromate priming from around rivet holes in wings and fuselages. Formerly this job was done by hand with small sandpaper discs.

Such results are duplicated every day by **O**sborn **B**rushing **A**nalysts. They can solve *your* brushing problems of product cleaning, burr removal, roughing, polishing or finishing with similar startling economies. For complete information at no cost, call your nearby Osborn representative or write to *The Osborn Manufacturing Company, Dept. C-2A, 5401 Hamilton Ave., Cleveland 14, Ohio.*

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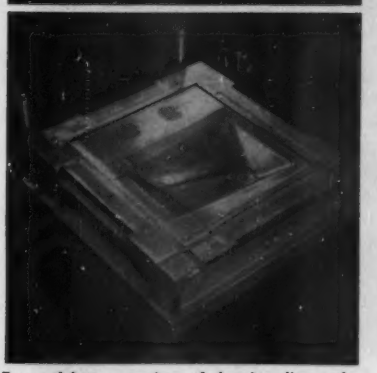
OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



Top and bottom sections of drawing die, made of BTR, which was used in manufacture of the water-fountain top illustrated at right.

Die Draws 25,000 Stainless Pieces Without Showing Any Wear

The oblong section shown at right, a stainless-steel top for an electric water fountain, is one of a vast array of interesting specialty products being turned out by L. F. Grammes & Sons, Inc., Allentown, Pa.

To manufacture this part economically, engineers at the Grammes plant required a die having good wear-resistance, low distortion and good resistance to shock. What's more, they also wanted a tool steel that was both easy to machine and heat-treat.

BTR (Bethlehem Tool Room) was selected for the drawing die, which was hardened to Rockwell C-60 before being put to work in a 200-ton press. It's been giving a good account of itself, too. At last report, some 25,000 water-fountain tops had been produced, without any sign of die-wear.

BTR is a tough steel, with outstanding resistance to abrasion. You'll find it ideal in every way for many intricate tool-and-die applications.

BTR is our general-purpose type of oil-hardening tool steel, and has this typical analysis:

Carbon	0.90	Chromium	0.50
Manganese	1.20	Vanadium	0.20
	Tungsten	0.50	

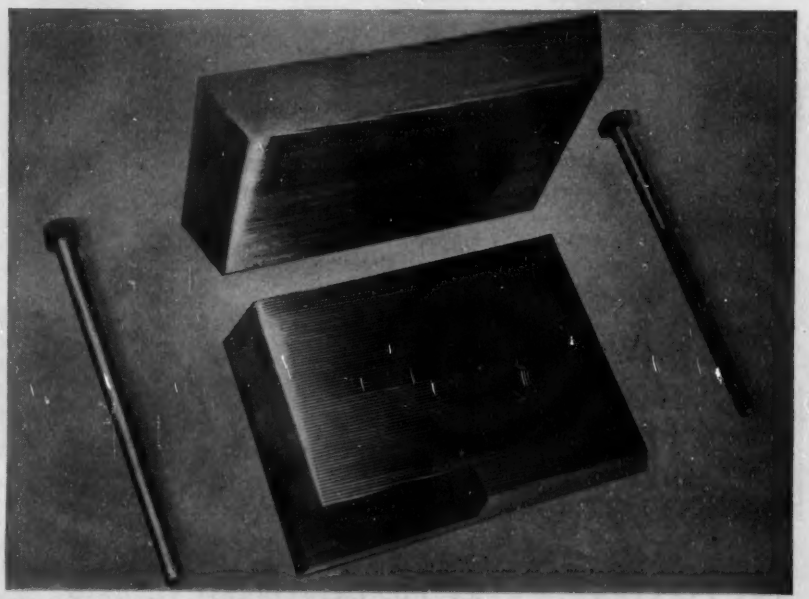
BETHLEHEM TOOL STEEL ENGINEER SAYS:

Don't Overlook the Interrupted Quench

One hears such a lot these days about isothermal annealing, martempering, automatic heat-treatment furnaces and a host of other modern processes that it is easy to overlook some of the old-time procedures which are still useful. For example, the interrupted quench.

An interrupted quench involves quenching a tool in water, then removing it from the water before the hardening transformation has started, and finishing the quench in oil. The tools should be removed from the oil while still warm, and should be tempered immediately. On water-hardening steels, an interrupted quench permits hardening of intricate sections which might crack if water-quenched all the way.

With oil-hardening steels, the interrupted quench permits hardening of sections which are too large to harden properly if oil-quenched all the way. At the same time this practice avoids the cracking which might possibly occur if a straight water quench were used.



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New Books . . .

TRANE AIR CONDITIONING MANUAL— *(Revised Edition) Published by the Trane Air Conditioning Co, La Crosse, Wis. 380 pages. Price, $5.*

The opening chapter of this book is a presentation of the basic laws of heat and cold, and applications of these laws to practical problems of air conditioning. Other chapters discuss human comfort and physiology of human heat control mechanism; heat gain and loss; properties of air and the psychometric chart; refrigeration; and calculations for conditioned air supply.

A chapter has been added to describe fan application and data, basic fan laws, and duct design data and nomenclature.

The text is illustrated with drawings, photographs, charts, and graphs. Problems at the end of each chapter show practical applications, the answers to which are given in a separate section. Reference section contains standard tables on air, refrigeration, pipe capacities for refrigerant liquid and vapor, and ducts.

•

MANUAL FOR PLASTIC WELDING — *By G Haim and J A Neumann. Published by The Industrial Book Co, affiliate of Industrial Publishing Co, 1240 Ontario St, Cleveland 13, O. 125 pages. Price $6.*

This is the second in series on plastic welding, and covers polyethylene. Two ways of welding are possible; induction high-frequency heating, and with a gas torch. The text covers gas-torch welding to give a practical man some theory and considerable useful information on how to actually do the work.

Aim of the book is to give basic data and techniques, which are still scarce, on the process that has gone through much development and has recently reached a stage of relative near-perfection. The authors are well qualified in their task; Mr Haim works for Rediweld Ltd, England; and Mr Neumann at American Agile Corp, Bedford, O.

The first two chapters cover the material; how it developed, what it is, and what its properties are. Later chapters take up equipment for welding, details of how welding is

These propeller blanks were forged on Cameron's 26,000 ton multiple ram split-die ferrous metal forging press.

ANOTHER LARGE SIZE AND INTRICATE SHAPE IS FORGED

Pictured above are 64" aircraft propeller blanks now being forged from steel, rough machined and cold pressed at Cameron Iron Works, Houston. These forgings, free of inclusions and crevices, are then drawn and shaped by the prime contractor into propeller blades.

You too may have the need for forgings which will result in improved quality products at lower manufacturing costs.

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done, how to line tanks, make pipe lines, and the like.

The book is fairly well illustrated with both sketches and photos, and the text is better written than average, running to short, clear descriptions. There are many references for more information, and the appendix includes a glossary, list of reagents and their effect on the plastic, and a set of conversion tables.

•

STRESS CONCENTRATION DESIGN FACTORS—*By R E Peterson, manager of Mechanics Dept, Research Laboratories, Westinghouse Electric Corp. Published by John Wiley & Sons, New York, NY. 150 pages, 8 x 10 in. Wire-ring binding. Price, $8.50.*

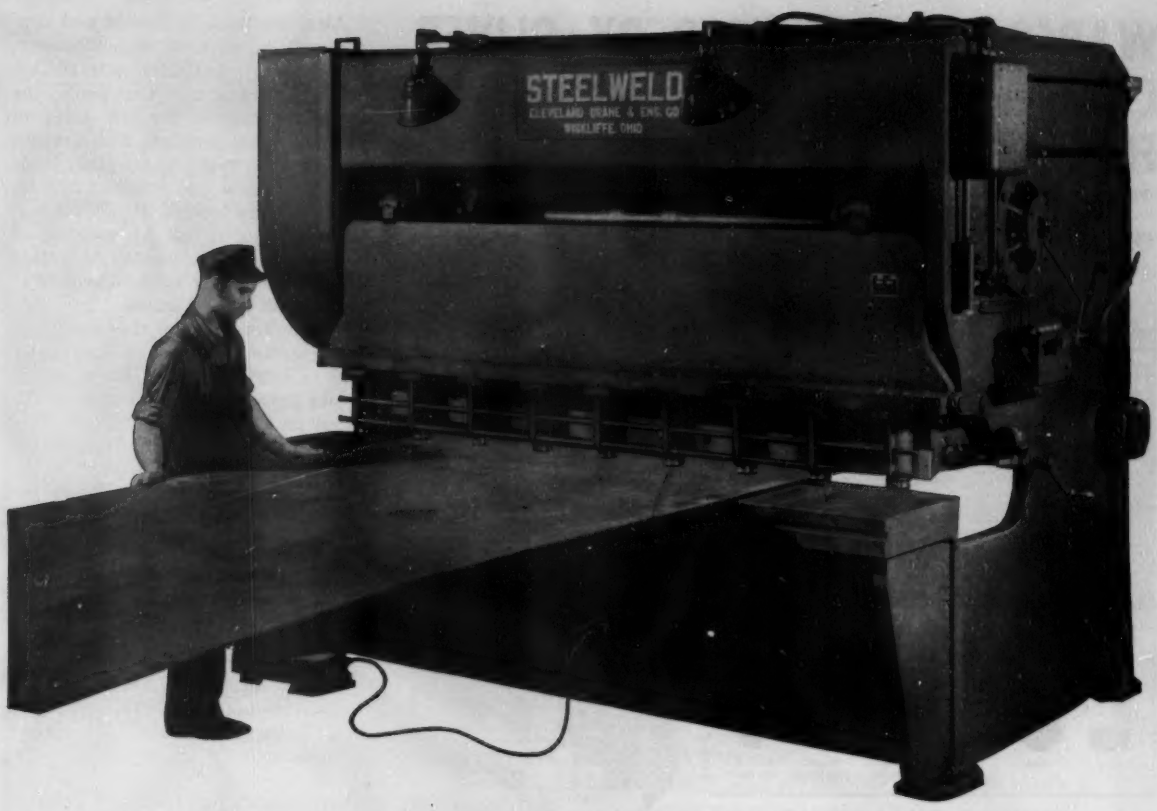
This book deals mainly with design calculations, covering such problems as grooves and notches, shoulder fillets, holes in plates and shafts, and various other design elements. Appendixes provide information on stress relations of a member with single groove or notch; application of Mohr theory for fatigue of brittle materials; derivation of relation for limited number of cycles; and derivation of combined stress relations.

•

HUMAN BEHAVIOR IN INDUSTRY—*By Wm W Finlay, director, Businesses Institute, Antioch College; A Q Sartain, professor of Psychology, Southern Methodist University; and Willis M Tate, vice-president, Southern Methodist University. Published by the McGraw-Hill Book Co, 330 W 42nd St, New York 36. 247 pages, 6 x 9 in. Price, $4.*

The first few pages of this book tells the story of hypothetical George McGowan. George has worked for his company for 15 years, and has recently been promoted from general foreman of one of the larger departments, to the job of plant manager. In his experiences, George encounters some 18 basic management problems. The rest of the book takes up in detail each problem, using a quotation from chapter 1 (George's experiences), to keynote the subject of the chapter. The scope of subject matter ranges from union contracts to the manager's function in public relations.

This method of presentation is simple and effective, because a reader sees George's "real-life" problem as a starting point. Then it is easy to compare the problem and its related discussion.



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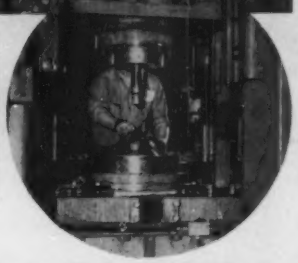

Cold extrusion of mortar shells is being performed on five Warco Presses by the Oliver Corp., Springfield, Ohio, with substantial savings in material and labor. Many operations normally required are eliminated or decreased, and, in 100,000 shells upwards of 265,000 lbs. of steel are saved.

Slugs are cut from 2-1/2" rod, approximately 1-3/16" in length. They are then subjected to a coining operation in an 800-ton Warco Knuckle Joint Press exerting approximately 150-ton pressure per square inch of slug area. A Warco 600-ton Eccentric Gear Press then performs a backward extrusion.

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For further data concerning cold extrusion presses contact Warco at The Federal Machine and Welder Co., Warren, Ohio. Their wide experience is at your disposal.

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Warco PRESSES

Also, the book is clearly and simply written, with careful, thorough, "true-to-life" attitudes toward behavior. Throughout the book, the theme is respect for all sides of a management problem, which means particularly respect for the basic human needs of workers. Thus, problems are solved by *"meshing" the attitudes*, so far as possible, of conflicting groups, instead of letting one attitude (usually management's) be used as a rigid guide.

Of the 3 authors of this book, one is a psychologist, one, a sociologist, and one, an engineer. Each author wrote the chapters most appropriate to his background, although all three men worked together putting finishing touches to all chapters.

The result is a fine, clear, impressive work, highly recommended.

•

THE TECHNIQUES OF SUPERVISION—*By Alfred R Lateiner. Published by National Foreman's Institute, Inc, Arthur C Croft Publications, 100 Garfield Ave, New London, Conn. 200 pages. Price $4. (cloth), $2 (paper bound).*

This is a foreman's book; a guide to foremanship, and a job-instruction text that covers its ground in a practical, easily understood manner. Most important, the book takes a tack at foremanship training from the human standpoint, attempting to relate all problems to the human sources involved.

•

THE CLOSED DIE FORGING PROCESS—*By P E Kyle, prof of Metallurgy, Cornell Univ. Published by The MacMillan Co, 60 Fifth Ave, New York 11, NY. 140 pages. Price $1.50.*

Prepared in cooperation with the Drop Forging Assn, this book is designed as an engineering text to cover briefly the essential steps in producing drop forgings and to discuss some of the uses of such forgings.

Much of the material on equipment and processes closely follows the form of and includes illustrations from the Special Reports on forging published in *American Machinist* several years ago.

The book is generally well prepared and illustrated and should be suitable as a general introduction to drop forging. There is not adequate treatment of some subjects (making the dies is covered in two paragraphs) to make the book of use as

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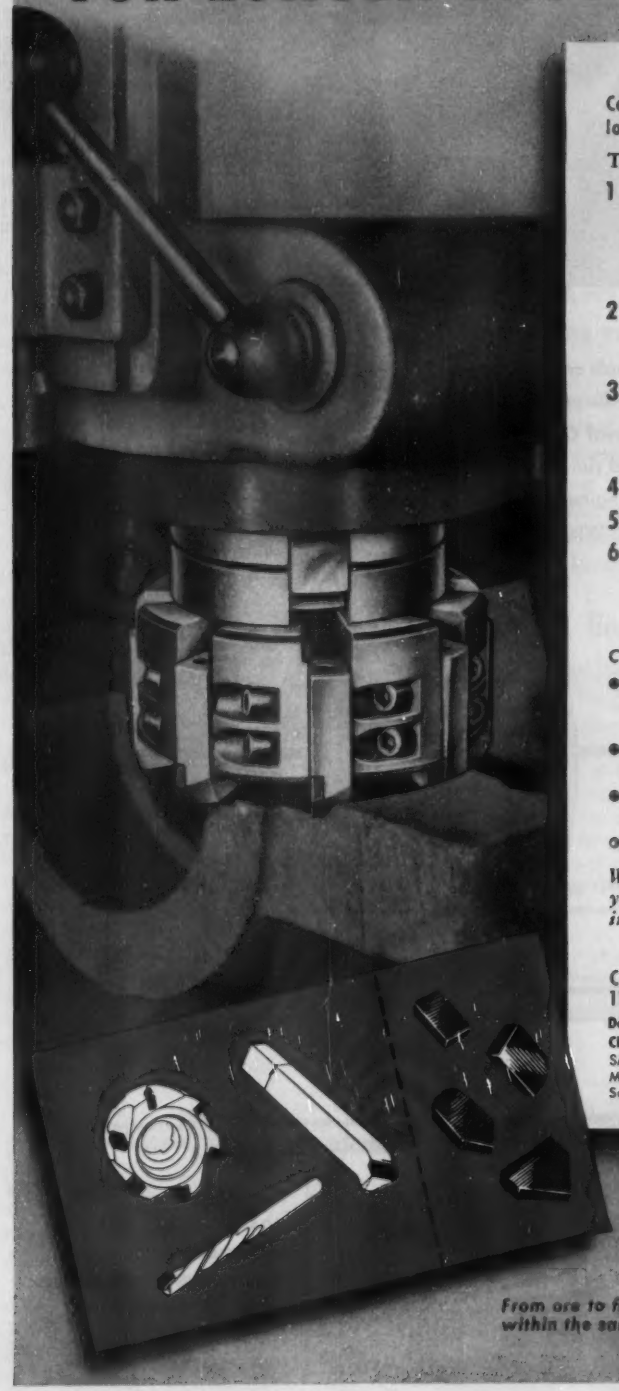

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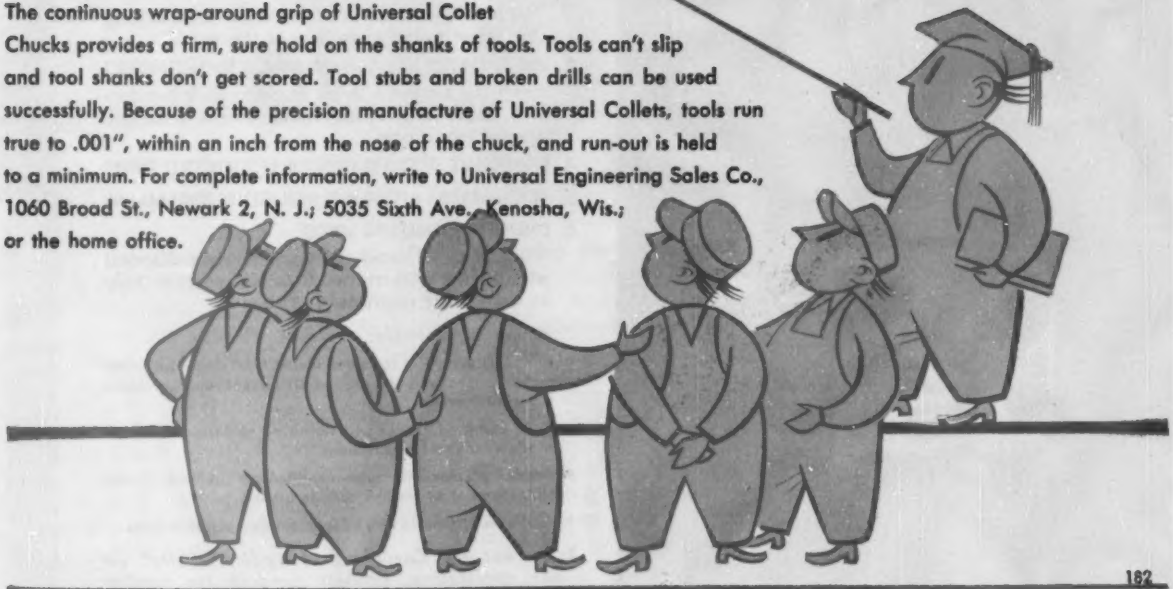

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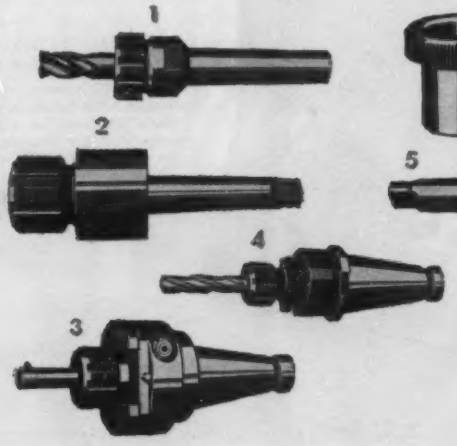


1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

a reference beyond the introductory level. However the glossary of forging items, the descriptions of equipment, and the discussion of forging operations are sufficiently detailed to serve as a reference source.

•

THE HEART OF THE MATTER—*Latrobe Steel Co, Latrobe, Pa. 16mm, sound, color. Running time, 22½ min.*

Tool steel manufacture is shown in detail with demonstration of methods employed to control quality. Tool stresses induced by machining, heat-treating, and grinding are discussed along with the methods for minimizing them. There are interesting shots showing cutting tools failing in service, and analysis of the causes.

The film is available either in conventional reels or with a self-contained, desk-type projector that eliminates need for a completely darkened room.

•

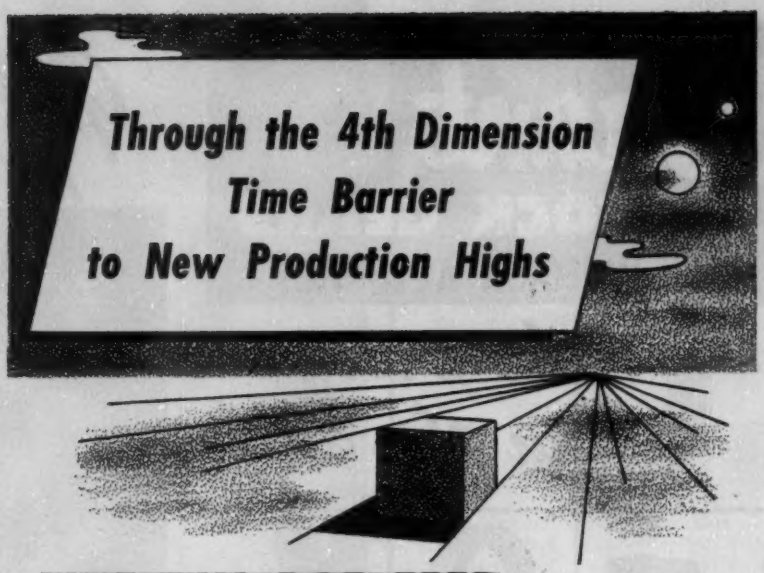
INSPECTION ACTIVITY AND INDUSTRIAL SAFETY—*Publication No. B-72, Division of Research and Statistics, Department of Labor, State of New York, 80 Centre St, New York 13, NY. 148 pages, 8½ x 11 in.*

Control of industrial accidents is a major function of the state labor department in New York. This function started in 1887 and now involves 330 inspectors who enforce compliance with the state's safety law and offer additional safety services.

Originally intended to determine the usefulness of this service, this report goes far beyond the area of self-justification. In addition to interesting data on the relationship between enforcement and accident rates, the report includes data on accident trends in New York and the relationship between code and non-code accidents.

Beyond this is the coverage of industry experience in nine companies and a study of the safety programs in 22 other states. All in all there is much of interest and value for the plant safety director in this report.

One example shows the need for eternal vigilance. A railroad with a good safety record had a diligent program, constantly hammering the need for safety. There was much resentment, however, and the program was experimentally relaxed. Within three weeks, there had been a large increase in accidents and two men had been killed. The safety hammering was immediately resumed.



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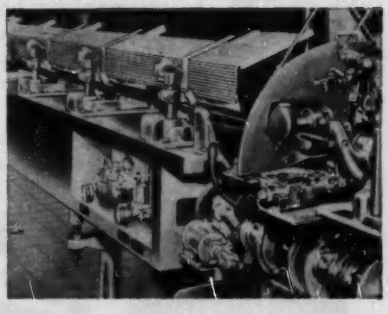

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COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

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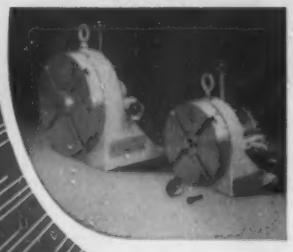

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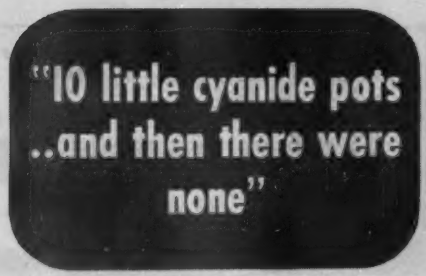
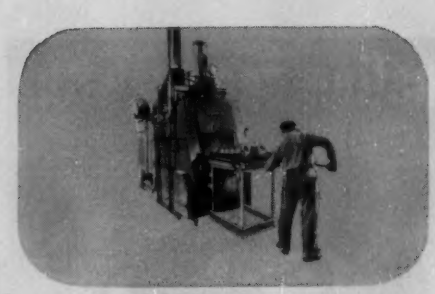
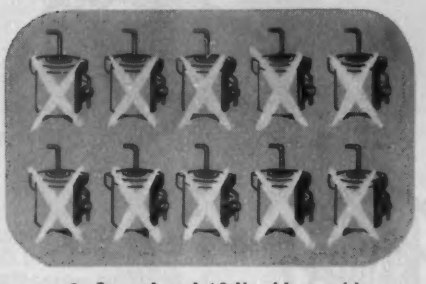


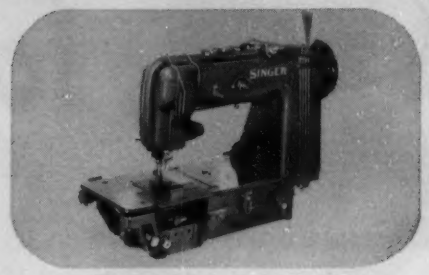
1. Featuring Singer Sewing Machines and Lindberg Carbo-nitriding Furnaces.



2. Singer Manufacturing Co. bought a new Lindberg Carbo-nitriding furnace.



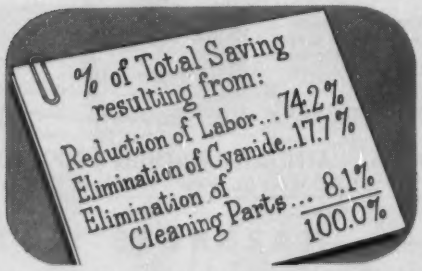
3. It replaced 10 liquid cyanide furnaces.



4. The new furnace heat treats parts for "industrial sewing machines"... used for stitching canvas, mattresses, overalls, etc.

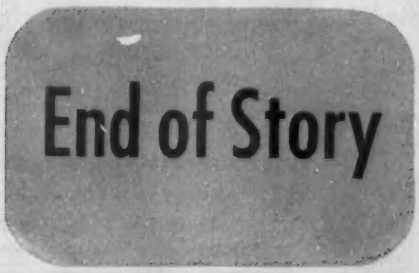
5. In 12 months, the new Lindberg Carbo-nitriding furnace paid for itself in savings.

6. Mr. Lloyd R. Raymond, Supt. of heat treating at Bridgeport plant of Singer.



7. ... submitted this report to his top management.

8. ... with this requisition for a second Lindberg Carbo-nitriding furnace (to double production of carbonitrided parts).



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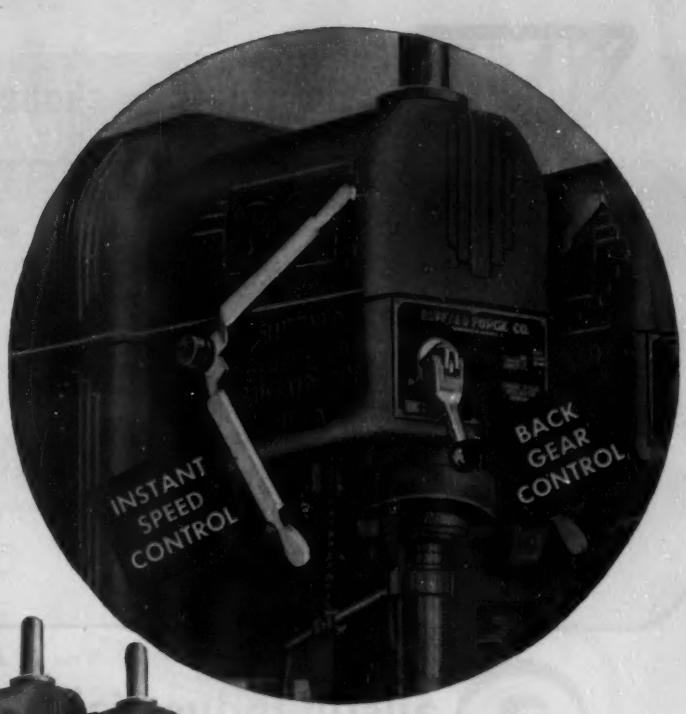

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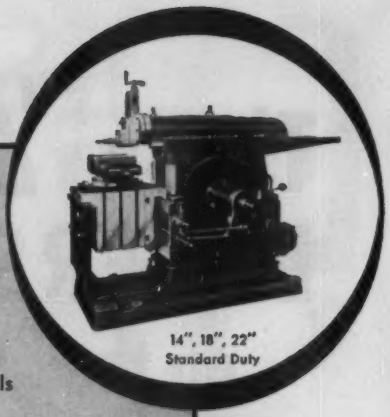

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COMFORTABLE NOSE PADS — Spread goggle weight broadly*

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*FX9200 model furnished with adjustable nose pads for hard-to-fit workers.

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End Mills
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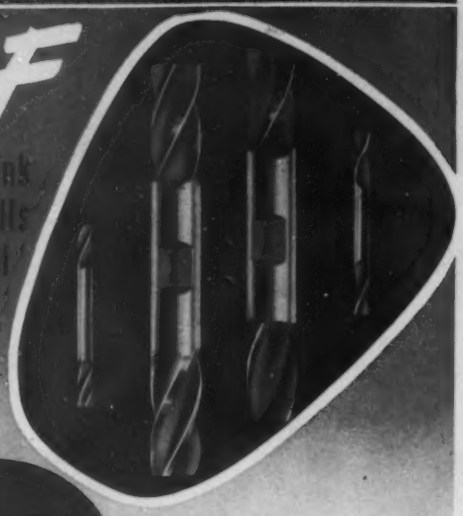

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13" Stroke

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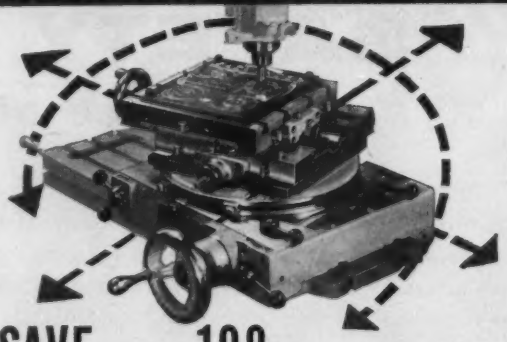

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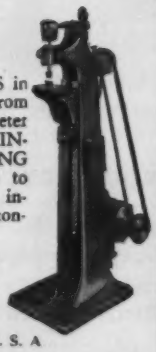

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Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License issued by John Milton Luers Patents Inc

EDLUND
Sensitive Drilling and Tapping Machines for Economy and High Production
Capacities to 1½"
Write for latest Bulletins
EDLUND MACHINERY CO.
Division Bradley-Edlund Corp.
Affiliated with Precision Castings Co. Inc. Cortland, New York

WALTHAM SUB-PRESSES...

. . . for precision work

Arch Sub-Press

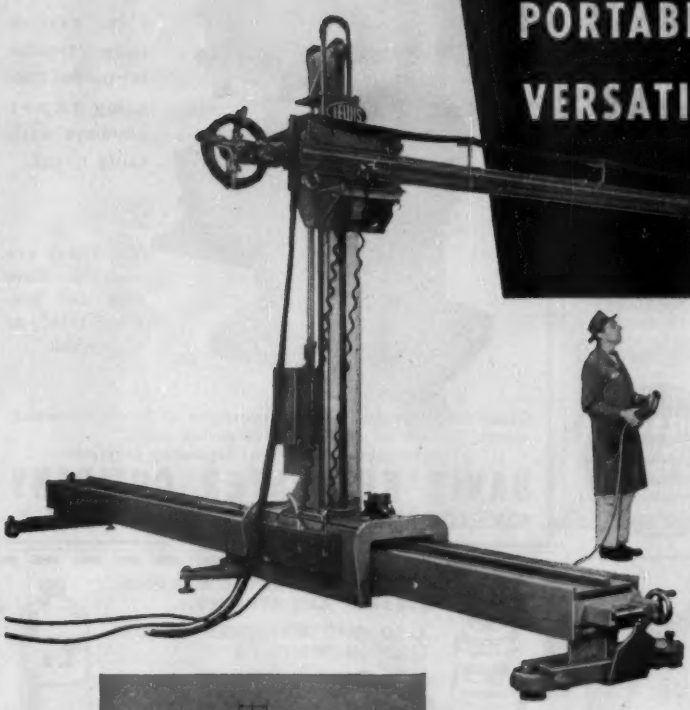
The cylindrical plungers in the Waltham Sub-Presses slide in babbitted bearings. This bearing is tapered on the outside and can be forced downwards, thus reducing the inside diameter to fit the plunger when the latter becomes worn through use. Exact alignment and constant precision can be maintained throughout the life of the die. Write for information about the nine sizes.

Overhang

WALTHAM MACHINE WORKS
HIGH STREET, WALTHAM, MASS.

Unlimited

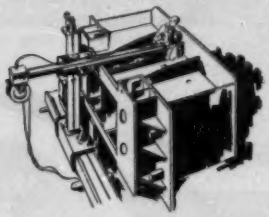
ADJUSTABILITY
PORTABILITY
VERSATILITY

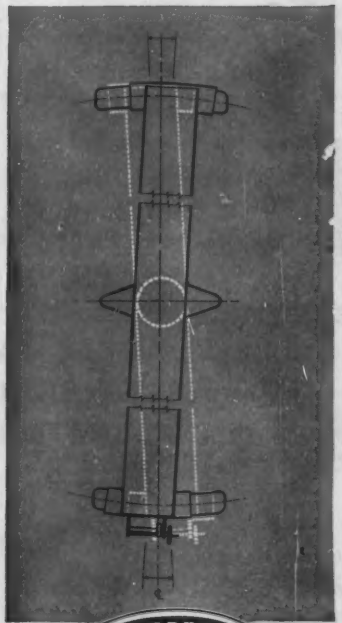


WITH THE NEW

Lewis

UNIVERSAL
WELDING FIXTURE





1998-LW

Complete portability . . . simultaneous 3-directional travel . . . and an adjustable base are the exclusive features of this new low-cost unit.

The LEWIS Automatic Welding Fixture can be readily moved to any location in your plant. Set-up time for precise positioning of large weldments is reduced 60% or more through utilization of the adjustable base mechanism.

This unit has 18-feet of longitudinal travel and 10-feet of transverse travel, with 9-feet of clearance under the boom. In addition, any standard head for welding, flame cutting or hardening can be installed.

For assured versatility in production . . . specify the new LEWIS Universal Welding Fixture.

LEWIS WELDING AND ENGINEERING CORP.
68 INTERSTATE ST. • BEDFORD, OHIO

LEWIS

WE BUILD SPECIAL MACHINERY TO YOUR SPECIFICATIONS

ACCO products

NOW for only $550 (less accessories, F.O.B. Bridgeport) you can get this J-MODEL WILSON "Rockwell"*

The Best... Costs Less... to Use

Eliminate costly customer complaints. Test hardness at various manufacturing stages with a WILSON *"Rockwell"* Hardness Tester. Benefit by the long experience of WILSON'S Standardizing Laboratory. A genuine *"Rockwell"* tester pays for itself.

WILSON Makes a Complete Line

There are two types of WILSON *"Rockwell"* Hardness Testers... Regular and Superficial. They come in many styles with accessories for testing flats, rods, rounds, and odd shapes. For micro-indentation hardness testing, there is the WILSON TUKON.

Write for information and let us make recommendations

WILSON "ROCKWELL" and TUKON Hardness Testers

ACCO *Trade Mark Registered

WILSON MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE

230-B Park Avenue, New York 17, N. Y.

CUTTING ECONOMY

MODEL RC 250

SAJO HYDRAULIC HACKSAW represents the latest addition to the SAJO line of Hacksaws built by Sweden's largest Hacksaw manufacturer. This Heavy Duty 10" x 10" Production Hacksaw incorporates the unique feature developed by SAJO providing instantaneous finger-tip controlled cutting pressure insuring maximum cutting efficiency and saw blade life. Designed for simple fool proof operation and incorporating the sturdy construction and painstaking workmanship on which the SAJO reputation has been earned, the Model RC 250 represents an outstanding value in this type of metalworking equipment. Also available are, SAJO Utility Hacksaws; Model RC 30 6" x 6" and Model RC 45 9" x 9".

Prompt delivery — Attractive Price — Write for Folder!

austin industrial corp.

76-F MAMARONECK AVE., WHITE PLAINS, N. Y.

Dealers in principal cities

Look for the Austin Seal — your full guarantee of satisfaction!

KEYSEATING

The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseater, assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY

403 EXCHANGE ST. ROCHESTER, N. Y.

INKS FOR METAL MARKING AND ETCHING.

ALSO THE MACHINES TO USE THEM IN. WRITE TO

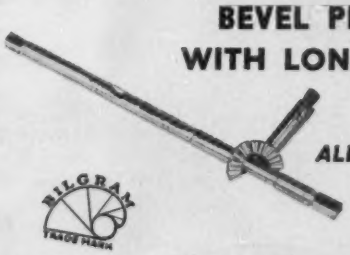
The ACROMARK Company

7-13 MORRELL ST., ELIZABETH 4, N. J.

There are thousands of valuable facts and figures about real savings made with new machinery and equipment in your

1954 PRODUCTION PLANBOOK for Metalworking

BEVEL GEARS AND BEVEL PINIONS WITH LONG STEMS



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ALL TYPE GEARS

•

BILGRAM

BILGRAM GEAR & MACHINE WORKS

1217-35 Spring Garden, Philadelphia, Pa.

A

AB

B

O

What Type American Are You?

It takes a lot of different types of people to make America what it is. And it takes different types of blood to make a blood bank . . . each as important as the other . . . each needed desperately.

Before the next 60 seconds have ticked away, four Americans will need blood to save their lives.

Give blood today . . . and save a life tomorrow!

the blood you give helps someone live!

GIVE BLOOD NOW

NATIONAL BLOOD PROGRAM

WILLEY'S
TUNGSTEN CARBIDE
TOOLS

STANDARD TOOLS

SOLID TUNGSTEN CARBIDE REAMERS

TIPPED TWIST DRILLS

SOLID TUNGSTEN CARBIDE ROUTER BITS

Willey's—The COMPLETE LINE of cutting tools — made complete in our own factories. Hundreds of standard sizes always in stock.

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Excellent service on special tools built to your specifications. Send us your prints. You will receive prompt acknowledgement, quotation and delivery date.

WRITE FOR CATALOG

WILLEY'S CARBIDE TOOL CO.
1342 W. Vernor Highway Detroit 1, Michigan

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WORKBENCH TOP
... Resinwood
ShopTop
30%
"HARDER THAN MAPLE"

TOUGH
WARP-FREE
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For All Industries

ShopTop quality is superior to maple — with up to 30% greater economy. Select kiln-dried cores, bonded under pressure and heat, provide a built-in impact cushion to give longer life. Smooth Resinwood facings resist acid, alkali, oil, and grease. For new or replacement work benches.

Made in any size to meet your requirements.

Available through selected industrial distributors in principal cities or write direct for sample and price list.

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ROCK ISLAND MILLWORK COMPANY
RESINWOOD DIVISION
Established 1868 Rock Island 7, Illinois

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BATTELLE
MEMORIAL INSTITUTE OF COLUMBUS, OHIO
REPORT
ON THE ADVANTAGES OF
NORTH MISSISSIPPI

for new and expanding industries in the MACHINERY AND FABRICATED METAL PRODUCTS FIELDS. For a free copy of this new 40-page illustrated report, write on your letterhead to:

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? Can you measure taper as quickly ? and as economically as straight bars ?

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famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

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Precision Power Presses and Feeds
Since 1889

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CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

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NEW ADVERTISEMENTS: Address N.Y. Office, 330 W. 42 St., N.Y. 36, N.Y., for Aug. 16th issue closing Aug. 2nd.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

CHIEF TOOL Engineer—with broad experience in tooling, metal stampings and assemblies. Responsibilities—tool engineering, toolroom, design, estimating and methods. Medium size company located in Philadelphia, Pa. Good future to man who can produce. Submit complete resume. P-3181, American Machinist.

SELLING OPPORTUNITY OFFERED

DIAMOND TOOL producers wish nationwide distributor or agency to handle all sales operation. Box SW-3415, American Machinist.

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SALARIED POSITIONS, $5,000 to $35,000. We offer the original personal employment service (established 44 years). Procedure of highest ethical standard is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 652 Brisbane Bldg., Buffalo 3, N. Y.

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MODERN MANUFACTURING FACILITIES AVAILABLE IN OUR MACHINED AIRCRAFT PARTS DEPT.

Monarch Air Tracer Lathe—20" & 14"
(Shaft work up to 14x40. Contour Turning 28" diameter.)
Monarch Keller Lathe—16"
Hendey & Monarch Engine Lathes
Internal & External Grinders
Also modern drilling and milling equipment

J. G. TILP, INC.
BOX 554, UNION, NEW JERSEY

The world's best . . . one-piece, drop-forged—not welded—of mild carbon steel, heat-treated, with head accurately milled for standard tables on lathes, planers, boring mills, milling machines. Integral washer and nut. Sizes: up to 30". Write for prices.

THE OK TOOL COMPANY
MILFORD 2, NEW HAMPSHIRE

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them
GENERAL PATTERN WORKS
2711 Rack Street Cincinnati, Ohio

WANTED
MFR'S AGENTS—CARBIDE

Excellent opportunity for agressive agents to represent established, progressive mfgr. of tungsten carbide sold to metal working plants. Exclusive territories now open: Western Pennsylvania; Southern Ohio; Texas. Write **Sales Manager, Adamas Carbide Corporation, Kenilworth, New Jersey.**

SELLING OPPORTUNITY WANTED

ESTABLISHED MANUFACTURER of custom equipment for the plastic, electronic, rubber, and textile industries in New England desires to supplement sales through representation of related mechanical items. Facilities are available for conversion, alteration, assembly, storage, distribution and service. RA-3481, American Machinist.

CONTRACT WORK WANTED

Old-Established firm, already making under license certain American Machines, open for similar arrangement with any firm desirous of having manufactured special machines which have an appeal, and need high-class workmanship. CWW-3051, American Machinist.

Vice President of a large Automotive parts Manufacturing plant
Desires a change of location

Experienced in Administrative work, Production, Labor Relations, Foundry and Smelter operations. Interested in General Management.

PW-3318, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

PEACOCK CORPORATION
Propane Gas Installations
and
Anhydrous Ammonia Plants
Paul E. Peacock, Jr., Pres.
Box 268 Westfield, N. J. Westfield 2-6258

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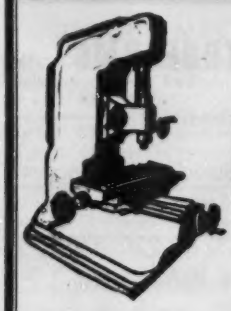
— illustrated —
Write today for folder describing book
MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., Fourth & Wabasha Sts.
St. Paul 1, Minn.



SEARCHLIGHT Equipment Spotting SERVICE

This service is aimed at helping you, the reader of AMERICAN MACHINIST, locate used and surplus new metalworking machinery and equipment not currently advertised. (This service is for user-buyers only.)

First, read the dealer ads on the following pages. A 5-minute study may locate the equipment now.

Second, send in the specifications of the equipment wanted on your own company letterhead, to

Searchlight Equipment Spotting Service
c/o American Machinist
330 W. 42nd St., N.Y. 36, N.Y.

Your requirements will be brought promptly to the attention of the used equipment dealers advertising in this issue. You will receive replies directly from them.

NO CHARGE • NO OBLIGATION

1941-1954 MACHINE TOOLS

CUTTER & TOOL GRINDERS
FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit

DRILLING MACHINES
ALLEN: No. 2 Drill—6 Spindle, 5" overhang
ALLEN: #2½ High Speed 15"
BARNES: No. 210, 2-spindle, 21" Swing
PRATT & WHITNEY: ½B x 60 Deep Hole Drilling & Reaming Machine, 2-spindle
RADIAL DRILLS: Archdale, 5', 6' & 7', new

GEAR MACHINERY
FELLOWS: 61A & 64A Shaper, 18" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)
INTERNAL GEAR GRINDER, GG-31

GEAR TESTERS
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 3 Bevel Gear Tester
GLEASON No. 4 and No. 6 Bevel Gear Testers, Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GEAR HOBBERS
CLEVELAND: #130 & 140 Rigidhobbers
REINECKER 60"
BROWN & SHARPE No. 44 20" cap.
SCHUCHARDT & SCHUTTE, 36" cap.
LEES BRADNER 49A

GRINDERS—CYLINDRICAL
BROWN & SHARPE: No. 10 cap. 6"x18" plain
CINCINNATI: 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 12"x18" Type C, Universal
NORTON: 10"x36", 30 Deg. Angle Wheel
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE
GEAR GRIND MACH.: GG-19, 10"x24" Hydr. Spur Gears and Splines
GLEASON: #17, 23½" P.D.
PRATT & WHITNEY: 10" single and double
INTERNAL GEAR GRINDER, GG-31 wheel, hydraulic feed

GRINDERS—INTERNAL
BRYANT: Nos. 5, 5Y, 16-16, 16-CP-16, 16-28, 24-L-36
HEALD: #50 Planetary
HEALD: #72A3 Sizematic
HEALD: #72A3 & #72A5 Extended Bridge

GRINDERS—RADIUS
VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #649-16, cap. 6" to 16" dia.
VAN NORMAN: #3½" Un. Radius

HONING MACHINES
BARNES: Model 224, 4" dia. x 16" stroke
BARNES: Model 172, 7" stroke.
MICROMATIC: H-610 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2 spindle, ¼" to 1" dia.

LAPPING MACHINES
FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES—PRODUCTION
BLOUNT: Polishing speed lathe 12" dia. x 48" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
POTTER — JOHNSTON: #4D Auto Turret

LATHES—TURRET
BULLARD: 36" Vertical turret
WARNER & SWASEY: #1A, #2A, #3, #3A, #4, #4A & #5
HERBERT: #0, #2, #4, #7, #8 and #9B/30 Sizes, new

LATHES—TURRET—continued
WEBSTER & BENNETT: Vert. 36" & 48" (New)

MILLING MACHINES
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: 4" Twin Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
MARVEL: No. 6 Hacksaw, 6"x6"

THREAD MILLERS & TAPPERS
HALL PLANETARY: Mod "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity.
NATCO: 16 spindle Tapper ⅜" cap.

MISCELLANEOUS
GARDNER: Model 84A Double Disc Grinder, 23" Wheel
MOLDING MACHINES, ROLLER JOLT: Osborne Model 2047-S
AUTOMATIC SCREW MACHINE, Wickman Single Spindle, 7/16" New
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½" & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
HARDNESS TESTER: Grogan Brinell, 16-8
SHEFFIELD: Precisionaire Gauge
SUNDSTRAND: Double-End, #53, 42" & 60" Centering Mach.
WIRE FORMING MACHINES: 4-slides (new)

TRIPLEX MACHINE TOOL CORP. ESTABLISHED 1919
75A West Street, New York 6, New York — Cable Address TRIMACTOOL

A TRUE BUY ON THOMPSON TRUFORMS

1949 & 1951 machines in excellent condition

2—Thompson 12 x 28 x 40 Hydraulic Truform Surface Grinding Machines, new 1949, serial numbers TC83514 and TC83539, each machine motor drive with 20 HP 220/440/3/60 spindle drive motor, complete with truform grinding fixture, automatic cross feed, automatic up and down feed, coolant pump, tank and piping, table working surface 16" x 40".

1—Thompson 12" x 28" x 36" Hydraulic Truform Surface Grinding Machine, new 1951, serial #TC503688, 20 HP 220/440/3/60 spindle drive motor, complete with truform grinding fixture, automatic cross feed, automatic up and down feed, coolant pump and piping, table working surface 16" x 36".

WRITE WIRE OR PHONE

UNITED MACHINERY & TOOL CORP.
85 THOMAS ST TEL. 6-7171 WORCESTER, MASS.

"LOOK THESE OVER"

No. 45 HEALD Boromatic, Single End, Two Spindle
12x30" MONARCH Geared Head Lathes
22"x336" MONARCH Model "M" Lathe, Two Carriages, M.D.
24"x12' BOYE & EMMES Hvy Dty Engine Lathe
30"x16' bed AMERICAN High Duty Geared Head Lathe
36"x17" AMERICAN Heavy Duty Geared Head Lathe, 1941
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe
60"x18' LeBLOND Heavy Duty Geared Head Lathe New 1952
Nos. 5A and 5Y BRYANT Internal Grinders
No. 18 BLANCHARD Vertical Rotary Surface Grinder
10x36 HILL CLARKE Plain Cylindrical Grinder
No. 172 HEALD Gap Internal Grinding Machine for large swing
10"x22" LANDIS Type C Hydraulic Plain Grinder —1942
24"x276" LANDIS Type B Hydraulic Pl. Grinder
Nos. 4D and 6B POTTER & JOHNSTON Automatic Lathes.
IL GISHOLT Universal Turret Lathe, 1946.
No. 0A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathes.
No. 2 CINCINNATI HS Dial Type Plain Millers.
No. 0-S CINCINNATI Plain Milling Machines.
No 2M CINCINNATI Vertical Miller 1941
FITCHBURG Plain Horizontal Mfg. Type Milling Machine, 24"x72" table.
No 1-16 CINCINNATI Plain Mfg Miller
No. 3B BROWN & SHARPE Dual Control Plain Miller
No. 5 CINCINNATI High Power Plain Miller with motorized overarm
3'11" CARLTON Radial Drill
CINCINNATI BICKFORD Precision Drilling Machine with Bullard Man-au-Trol Table.
5'13" FOSDICK "Economy" Radial Drilling Machine
E-5 & 2AL NATCO Multiple Spindle Drilling Machine
Nos. 64 and 72 FELLOWS High Speed Gear Shapers
No. 12 FELLOWS Gear Shaver, 1943.
No. 36BM GOULD & EBERHARDT Gear Roughr
16/20" GOULD & EBERHARDT Industrial Shaper
36" OHIO "DREADNAUGHT" N.D. Shaper
100" BETTS Vertical Boring Mill, 2 heads.

WIGGLESWORTH INDUSTRIAL CORPORATION
203 Bent St. Cambridge 41, Mass.

BUY FROM STOCK
Telephone
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FALK
MACHINERY COMPANY

10 WARD ST.
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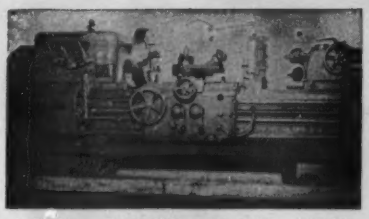
Every Item Guaranteed as Represented



24"x10' AXELSON GEARED HEAD, HEAVY DUTY MODEL "E" 28" ACTUAL SWING, M.D. TAPER ATTACHMENT.

LATHES

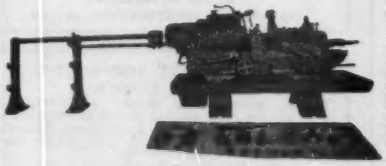
24"x12' BOYE & EMMES Timken Bearing, Geared Head, Lathe. Late Type.

27"x16' NILES, BEMENT, & POND Geared Head Lathe, 9' centers, M.D.

24", 36" BULLARD Vertical Turret Lathe, New Era, Turret Head, Side Head, Motor Driven.

No. 601 W.D. OSTER Motor Driven Turret Lathe, 1½" capacity, Late.

No. 2, No. 5 WARNER & SWASEY Geared Head Turret Lathes, Bar Feed, Motor Driven.



No. 7 BARDONS & OLIVER Universal Turret Lathe. 2½" capacity. Preselector Head, Late Type.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine, Motor Driven, Late type.

No. 1 LaPOINTE Motor Driven Horizontal Broach, 5 tons cap., 38" stroke.

50 HP. CHICAGO PNEUMATIC Air Compressor. Type NSB, 253 CFM, Piston Displacement.

10"x10" RACINE #30-C Hydraulic Heavy Duty Shear Cut Power Hack Saw, 1946.

10'x10 ga., 10'x¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

MILLING MACHINES

#2-1B CINCINNATI Plain Auto. Milling Machine, M.D. Late Type.

#2 KEMPSMITH Horiz. Maxi-Mill, Motor in base, Vert. Head.

#08 CINCINNATI Vert. Mill, Plain & Rotary Table Type.

#3B KEARNEY & TRECKER Vertical Milling Machine, Motor in base.

No. 0-8 CINCINNATI Rise & Fall Horiz. Mill, Late Model.

No. 3B KEARNEY & TRECKER Horiz. Mill, Double Overarm, Motor in base.

No. 2M CINCINNATI Universal Horizontal Mill, Full Equipment, M.D.

96" x 86" x 28' NEWTON PLANER TYPE MILLING MACHINE. 2 Heads on Rail; 2 Side Heads; Pendant Control; Late Type; Inspect under power.

DRILLING MACHINES

4'x15" Column CINCINNATI-BICKFORD "Super-Service" Radial Drill, Motor on arm, Box table.

4' x 15" CARLTON Radial Drill, Motor on arm, 48 spindle speeds, 1943, Late Type.

No. 262 BARNES Motor Driven Sliding Head Drill Press. 2" cap. in steel.

No. 2 M.T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

#M200 DEFIANCE Production Drilling Machine. 2" Cap. in Steel.
#5 M.T., Coolant System. Late Type. 26" Swing, 1942.

#7A Thomas open back inclinable Press 80 Ton cap. Flywheel M.D.

No. 5 FEDERAL Open Back Inclinable 4" stroke, Timken Bearing Flywheel, M.D.

600 ton NILES-BEMENT-POND Motor Driven Wheel Press, 86" between strain rods, 14' cap., 17" diam. ram.

#5, #7, #8 JOHNSON O.B.I. Presses. 56, 79, 90 tons cap. M.D. Flywheel & Geared Type.

GRINDERS

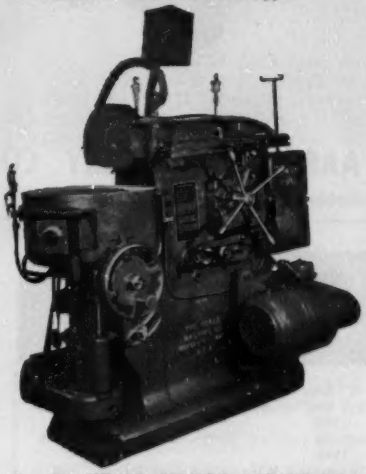
12" x 36" Landis Universal Cylindrical Grinder with Excello Internal Spindle, M.D.

6"x18" LANDIS Type "C" M.D. Hydraulic Cylindrical Grinder, Serial #29196.

6"x18" NORTON Vertical Hydraulic Surface Grinder, complete with magnetic chucks, coolant systems, Late Model.

#TG615 JONES & LAMSON Thread Grinder, Late, M.D. and TG848.

No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.



No. 22 HEALD MOTOR DRIVEN ROTARY SURFACE GRINDER. 12" Magnetic Chuck. Late Model.

20", 24", 28" GOULD & EBERHARDT V-Ram Shapers, M.D.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

30 K.W. LEPEL High Frequency Induction Heater.

No. 8LS FELLOWS M.D. Gear Lapping Machine. With Detachable Head, Universal Work Support.

No. 20, WATERBURY FARREL Thread Roller, ⅜" cap., 1944.

#0, ½, 1½ BUFFALO FORGE Universal Ironworker, Notcher, M.D.

15' x 10' x 36' BETTS PLANER, DOUBLE HOUSING, BOX TABLE, 2 Swivel Heads on Rail; 2 Swivel Side Heads; Pendant Control Variable Speed Main Drive Motor, 75 HP. Inspect under power.

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OHIO 5"

Table 48"x84" bed length 10' A.C. Motor, vert. travel 60", rapid traverse, facing att.

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Hoz. Bor. Mill 3¼" Table 60x30
Speeds 5 to 1200 R.P.M. New 1940

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Hoz. Bor. Mill 3" Table 58x32"
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JONES 60"
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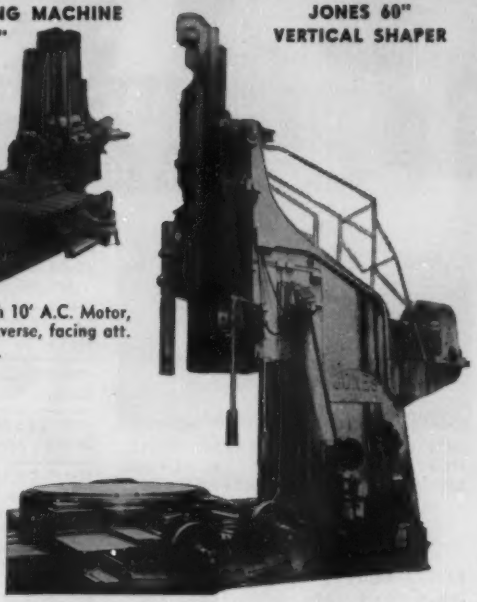

Table—72" diameter. Will move a distance of 36" either to the left or right of tool. Bed Length 154".

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650 Ton Verson Double Action Eccentric Press. 1940.
HP-100 LaPointe Horizontal Hydraulic Broach. 1945.
10" Pratt & Whitney Hyd. Gear Grinder. 1941.
12" Gleason Gear Generator. 1942.
No. 7 Gleason "Revex" Gear Rougher. 1943.
24D Hanchett Duplex Rotary Surface Grinder 1945.
16"x72" Norton Univ. Grinder. 1942.
17"x42" Norton Crank-o-Matic, 1943.
645 Fellows Gear Shaper 1942
TG615 Jones & Lamson Precision.
No. 35 Excello Precision Thread Grinder.
20"x33" Fay Automatic Lathe 1942.
24-36 Bryant Hydraulic Internal Grinder. 1942.
No. 72A3 Heald Plain Hydraulic Internal Grinder. 1941.
#2 Cincinnati Centerless Grinder 1945
No. 26 Norton Hyprolap 1942
No. 6DRE Potter & Johnston Automatic. Late.
No. H5 Libby Universal Saddle Type Turret Lathe. 1939.
No. 3R Gisholt Universal Saddle Type Turret Lathe. 1942.
No. 33 Sundstrand Vertical Rigidmil 1943

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10" Newton, cone
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18" Betts Crank Slotter, m.d.
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No. 1 Warner & Swasey "Electric", m.d., bar
No. 1A Warner & Swasey, m.d.
No. 1L Gisholt Universal, m.d.
No 1, 2 Cincinnati-Acme Full Universal, m.d.
No. 2A Warner & Swasey, m.d., bar
No. 2F Foster Fastermatic, m.d., Timken
No. 2G Morey 1" cap. bar
No. 3 Cincinnati-Acme Full Universal m.d., chucking
No. 3 Jones & Lamson, 1½" cap., full Universal, m.d.
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No. 4 Warner & Swasey, cone, bar and chucking types
No. 4A Warner & Swasey Universal, m.d., chucking
No. 4 Warner & Swasey, prosselector head, m.d.
No. 4 Gisholt Universal, m.d.
No. 4L Gisholt Universal, m.d.
No. 4FU Foster Fastermatic, m.d., latest
Model 4H12 Libby, cross sliding turret, m.d.
No. 5 Foster Universal Ram Type, m.d.
No. 5 Gisholt Universal, m.d., late type
No. 5 Warner & Swasey, m.d.
⅝" Pratt & Whitney Hand Screw Machine, cone, bar
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28" Libby Type C, m.d., chucking
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No. 2 Haskins pneumatic control, type 2 CAP
No. 3 Haskins, pneumatic control type 3 CAP
Acme Semi-Automatic 6 spindle, 1½", arranged for m.d.
No. 3C Haskins, pneumatic control, type 3 CAM, m.d.
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No. 336 cap. ⅜" W. J. Savage Co. Nibbler

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No. 4 Mitts & Merrill Keyseater, m.d.
Hendey Centering Machine, 8' bed, 4" dia. x 60" Length, m.d.
114CB Moline Tool Boring Machine, 2 spindle type, m.d., late
No. 2 Mitts & Merrill Keyseater, m.d.
Gorton Model AE Engraver
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3" Rockford horizontal, fixed table (2)
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36" Bullard vert. T/L, side head, #11325
72" Niles Bement Pond 2 heads, PRT, #17623
No. 46 Heald Boromatic precision late type
No. DB216 Excello 6 spdl. D/E borer, late

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3½ ft. arm 8" column American sensitive
4 ft. arm 13" column Carlton, MIB, late type
9 ft. arm 16" column American, late type.

GEAR HOBBERS
No. 12H Gould & Eberhardt universal
No. 36H Gould & Eberhardt universal
72" Schuchardt & Schutte universal

GEAR MACHINERY, MISC.
8" Rod Ring shavers, with crowning (2) 1943
18" Pratt & Whitney hyd. gear grinder, 1944
12" Model 224 Illinois involuto profile measuring machine, new 1943
13" Model Sheffield gear chamferer, 1947
No. 3 Barber Colman auto. hob sharpener, 1944
Nos. 71A, 75A, 712 and 715 Fellows HS shapers.

GRINDERS, CYLINDRICAL
4"x18" Cincinnati pl. hyd., plunge cut, 1946
10"x18" Norton types BA, A C, late models
10"x18" Cincinnati Simatic, type ER (2), 1941-1946
10"x36" Norton type C semi-auto. hyd. infeed
10"x36" Norton type C hydraulic (2), 1943
10"x36" Landis type DC, hydraulic, 1941
12"x36" Bath-Fitchburg universal
12"x36" Cincinnati universal, serial 1U-30-1D-5
14"x36" Landis type C, hydraulic (2), 1946
16"x36" Norton type C, hydraulic (2), 1943
16"x60" Landis self-contained serial 11122
18"/26"x72" Norton type C, hydraulic, 1945
16"/40"x120" Landis gap type, hydraulic, serial 16193
16"/48"x96" Landis gap type hydraulic, new 1941

GRINDERS, SURFACE
6"x18" Norton vert. spdl. hydraulic, 1942
8"x22" No. 3 Abrasive, motor in base (2), 1941
12"x36" Pratt & Whitney vert. spdl. ball bearing
12"x48" Model 300 Hanchett vert. spdl. 1948
72" No. 72 Hanchett rotary surface, 1946

GRINDERS, MISC.
No. 2 Cincinnati cutter grinder, late model
30" Ingersoll cutter grinder, late model

DISC GRINDERS:
Nearly every size

INTERNAL GRINDERS:
Nearly every size
No. 2 Cincinnati centerless (5), 1942-1943
No. 49 Van Norman radius, 1945

LATHES, ENGINE
14"x42" Hendey G.H., M.I.B., 1940
18"x96" Cisco G.H., 12 speed, swings 20"
24"x14 ft. bed American G.H., Q.C.G., serial 44070
32"x12 ft. bed Axelson G.H., toolroom, 1945
52"x30 ft. bed Niles Bement Pond G.H., like new

LATHES, MFG. & MISC. & TURRET
14"x13 ft. bed Betts Bridgeford axle lathe
14"x18" Line H. S. Carbo-lathe, 1943
17"x72" LeBlond Rapid production (5), 1946-1947
No. 3A Warner & Swasey long bed universal turret lathe, 1940
No. H5 Libby International saddle type universal turret lathe, 1940
No. 5 Jones & Lamson Universal ram type turret lathes, (2) late models

MILLING MACHINES
1-12 Cincinnati production miller
No. 4-36 and 4-48 Cincinnati Hydromatic production
No. 2 Cincinnati high speed dial type plain
No. 2B and 3K Milwaukee universal
No. 3B and 3K Milwaukee universal
No. 3B and 4K Kearney & Trecker plain, late type
No. 27L Van Norman universal, 1943
12", 18", 24" Cincinnati plain manufacturing
No. 6 Rosker heavy duty vertical
24"x24"x12 ft. Ingersoll adj. rail planer type mill, tracer controlled, 1945
30"x21"x12 ft. Ingersoll fixed rail planer type mill
42"x42"x18 ft. Ingersoll adj. rail double housing mill, 2 S.H. and 1 R.H. power cs rail and head
42" Ingersoll 3 spindle rotary continuous mill
42" Ingersoll 2 spindle rotary continuous mill
48"x20"x20 ft. Ingersoll fixed rail double faced planer type mill
60"x48"x16 ft. Ingersoll adj. rail double housing planer type mill, 2 S.H. and 2 R.H.
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PRESSES
2 to 70 ton Ferracute punching (several)
3 to 60 ton O.B.I., most every make
100 ton No. 50-D-36 Cleveland DC, steel frame, 1940
500 ton No. 1042 Verson, steel frame, air clutch, late model

SHAPERS
16" American heavy pattern auto-oiled, F.M.D.
24" Cincinnati Climax heavy duty, F.M.D.
32" Gould & Eberhardt Invincible, F.M.D.
36" Rockford vert. hyd. slotter, 1942

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36"x12' centers AMERICAN Heavy Duty 18 Speed Geared Head Lathe, AC-MD
50"x20' NILES-BEMENT-POND Geared Head Engine Lathe, rapid traverse
No. 1L GISHOLT Saddle Type Universal Turret Lathe, preselector head, bar feed, chuck, new 1943
No. 3A WARNER & SWASEY Turret Lathe, Timken spindle, electric chuck, tooling
No. 3 WARNER & SWASEY Turret Lathes, one bar feed, one chucker. New 1944
No. 4 WARNER & SWASEY Universal Turret Lathe, Preselector head, bar feed, late type.
No. 2 VAN NORMAN Plain Horizontal Mill, New 1943
No. 3-24 CINCINNATI Plain Hydromatic Mill, AC-MD
48"x48"x10' NILES Double Housing Planer, box table, DC reversing motor drive.
48"x48"x12' Cincinnati Double Housing Planer, power rapid traverse, DC reversing motor drive, box table, forced feed lubrication.
48" widened to 89"x12' DETRICK & HARVEY Double Housing Planer, box table, DC reversing motor drive
1½" LANDIS Bolt Threader, leadscrews, AC-MD
30" MORTON Hydraulic Keyseater, new 1943
No. 8A MITTS & MERRILL Keyseater, capacity 0 to 4" width, 36" stroke, tooling
4' FOSDICK Sensitive, New 1951
4' HAMMOND Jackknife Radial Drill, tapping attachment, new 1948
5'-13" column CARLTON Radial Drill, AC motor & gearbox on base
5'x15" Column CARLTON Radial Drill, Motor on Arm
6'-17" column CINCINNATI BICKFORD Super Service Radial Drill, power rapid traverse, motor on arm
36" BULLARD High Speed, fine feed attachment, Vertical Boring Mill, rapid traverse, new 1942
42" BULLARD Spiral Drive Vertical Turret Lathe, extra high column
42" KING Vertical Boring Mill, 10HP AC motor, power rapid traverse.
No. 5—55 Ton V & O, O.B.I. Press
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GRINDER, 16"x96" Landis Hyd., Late
GEAR SHAPERS, Nos. 64SAB, 81A & 81 Fellows
LATHES, 50"x30' Bed Niles, Late, Wet Hd.
14"x60" cen. Amer. T.A.
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36" Rockford Hyd. 1942

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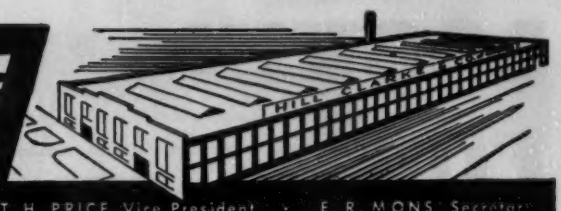

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Partial List

Automatics

1-1/16" Cleveland Model A (1942).

Boring Machines

No. DB2112 Excello Single End Borer.
100" Niles-B-Pond Vert. Bor. Mill.

Drills

No. 2 Avey Cam Fd. Drill. 14" Swing.
No. 2MA-6 Avey 24"-1 Spdl. Drill
2 Spdl.—24" SW.—No. 2 Avey.
No. K60H Fox 16 Spdl. Multi Drill
No. 2-20" 2 Spdl. Leland-Gifford LMS Drill
No. LBM-20" 3 Spdl. Leland-Gifford Drill.

Gear Machines

11" Gleason Gear Generator.
No. 12HS Gould & Eberhardt.
No. 36-BM G. & E.—3 spdl. Rougher.
615-A Fellows Gear Shaper.
612-A Fellows Gear Shaper.

Grinders

6"x18" Norton Type C Plain (1943).
10"x18" Norton Type C Plain Hyd. Cam Gdr.
10"x36" Norton Type C Grinder.
10"x36" Norton Type C Cam Grinder.
B-24—25" Chuck Arter Surf. Gdr.
TG615 J & L Thread Gdr.
No. 214 Besley Double End Disc Gdr.

Internal Grinders

No. 1109 Bryant Internal Gdr. (1951).
No. 5 Bryant Internal Grinder.
No. 5B Bryant Internal Grdr.
No. 16-16 Bryant Int. Grinder.
No. 16-28 Bryant Int. Grinder.
No. 16-38 Bryant Int. Gdr.
No. 24 L-36 Bryant Hyd. Int. Gdr.
No. 16 A-28 Bryant Internal Grinder.
No. 24-26 Bryant Int. Grinder.
No. 24-36 Bryant Internal Grinder.
No. 81 Heald Internal Centerless.
72-A5 Heald Int. Gdr. (1942).
No. 16-36" Blanchard Vertical Surf. Grinder.

Hill-Clarke Norton Type Motor Driven Grinders

10"x36" Centers. 14"x36" Centers.
10"x72" Centers. 14"x50" Centers.
10"x96" Centers. 14"x72" Centers.
18"x96" Centers. 14"x96" Centers.
18"-30" gap x 96" Centers.
18"x120" Centers
26"x96" Norton.

Hones

Model H-2 Micromatic Horiz. Hone.
Model 200-H5-Dbl. End. Micro. Horiz.
Model H-7 Micromatic Vert. Hone, etc.
No. 224 Barnes Vert. Hone.
No. 306-H Barnes Vertical Hone.

Lathes

R-14 Lo-Swing Automaite Lathe.
12"x21" Fay Automatic Lathe
18"x6' Am. Geared Head Lathe.
27"x12' American Geared Hd. Lathe.
36"x18' Putnam Grd. Hd. M.D.

Turret Lathes

No. 5W Acme Tur. Lathe (Late).
No. 2 Warner & Swasey Geared Head.
No. 3AL Gisholt, Cross-Slide Turret.
No. 3 Warner & Swasey Turret Bar Feed.
No. 4A Warner & Swasey Turret.
No. 6 Warner & Swasey, cone head.
2¼"x24" Jones & Lamson.
18" Libby, M.D.
No. 3H-10 Libby International, 29" SW
No. 4A Warner & Swasey (1944).

Planers

48"x36"x14' Gray, 2 Heads.
48"x48"x12' Cincinnati, 2 Heads.
60"x48"x27' American, 4 Heads.

Milling Machines

No. 4 Cinn. Pl. Hi-Speed Dial Type (1944).
No. 08 Cincinnati Vert. (1942).
10"x48" Hanson-Whitney Thrd. Mill.
10"x60" Pratt & Whitney Thrd. Mill.
12"x102" Mod. HT Lees Bradner Thrd. Mill.
54"x30"x16' Ingersoll Slab Mill.

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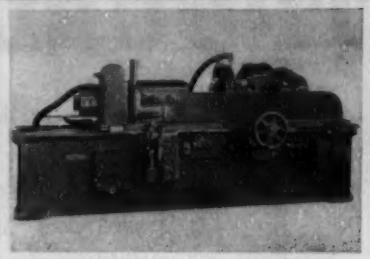

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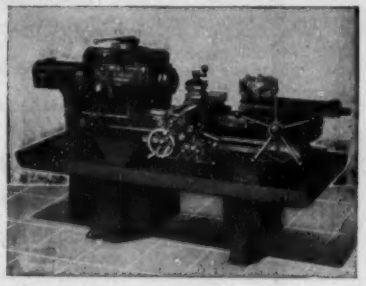

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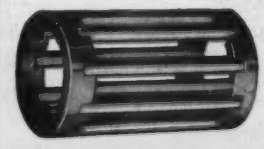

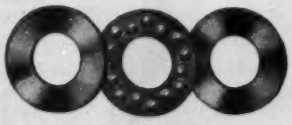

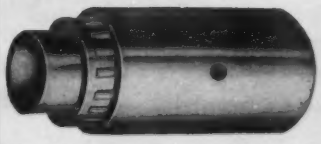

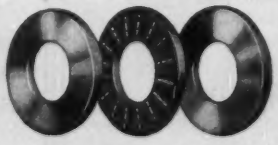

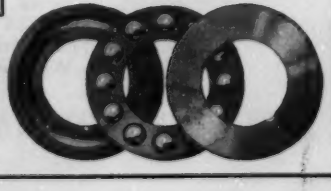

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Precision that lasts

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"Stamina" Features:

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W. B. KNIGHT MACHINERY CO.
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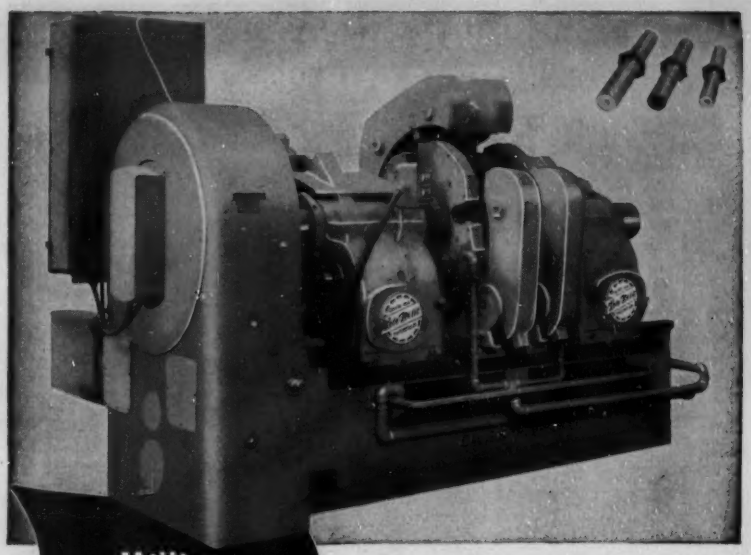

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What You Should Know about the BPS SYSTEM OF TAP SHARPENING *

—and how it can cut tap costs up to 75%!

Leading metalworkers find the B.P.S.* System reduces their tap costs by 50 to 75% — and more! And the same profitable plan is available to *you!*

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*Blake Precision Sharpening

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BLAKE FLUTE GRINDER

- Gives much more production per tap!
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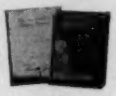

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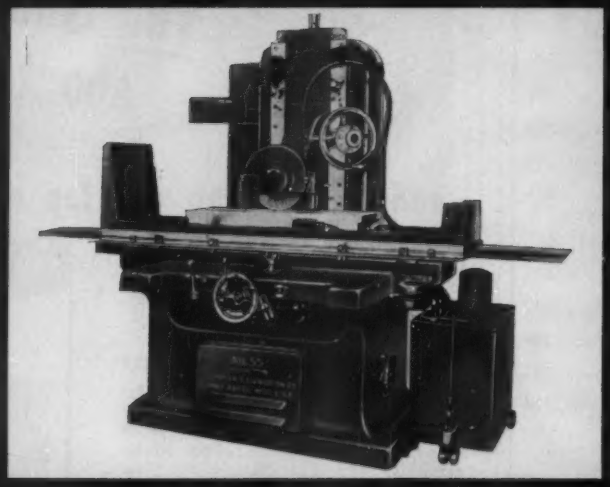

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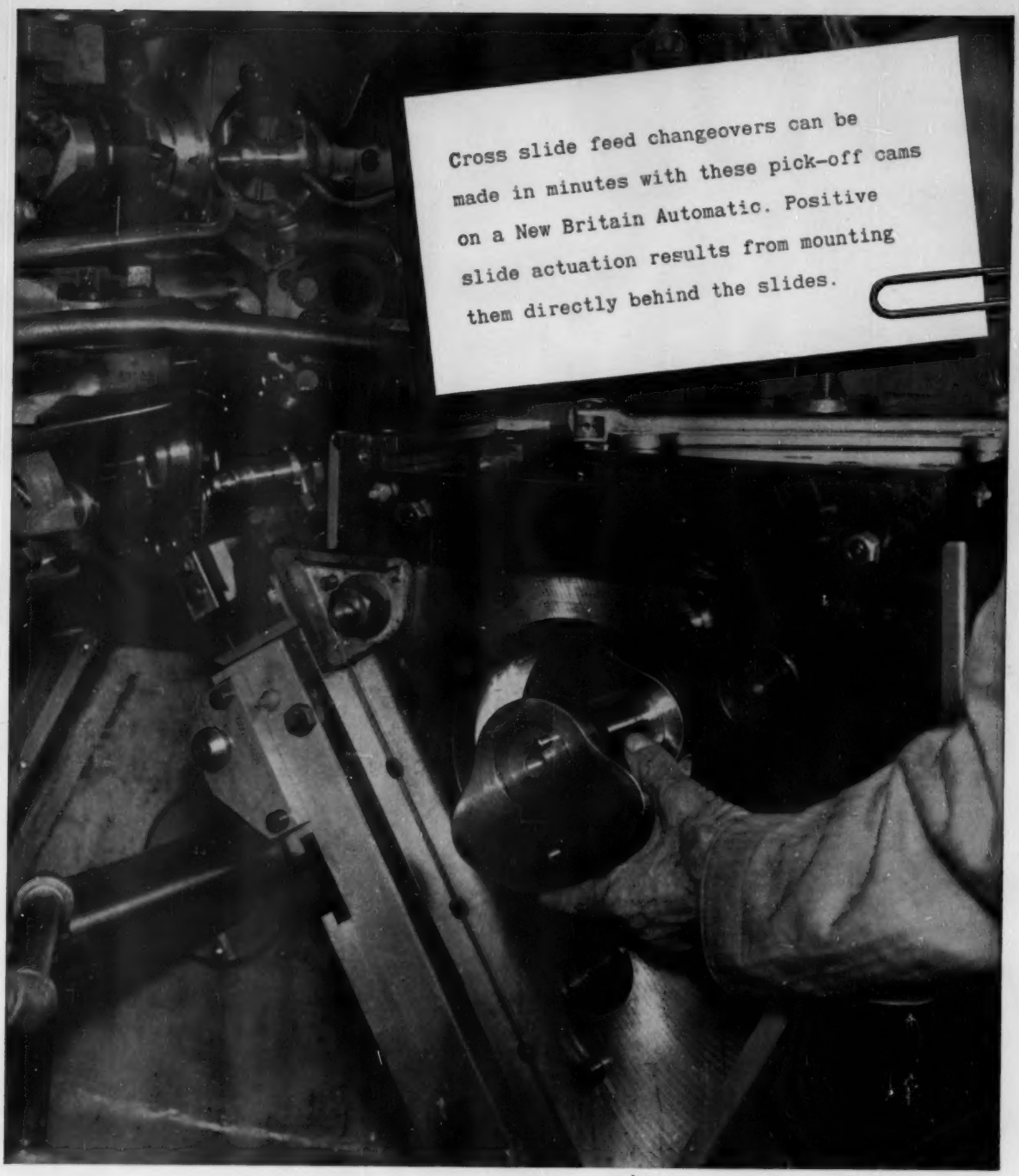
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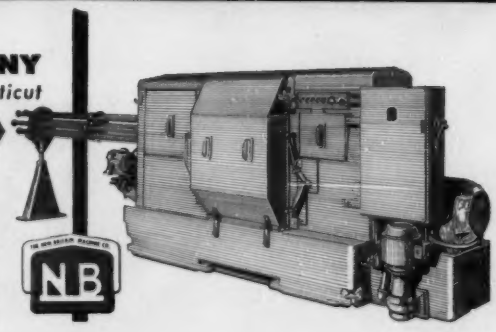

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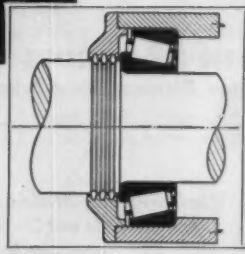
This symbol on a product means its bearings are the best.



LUBRICANT STAYS IN —DIRT KEPT OUT

Because Timken bearings hold shafts concentric with housings, closures are made more effective. Lubricant is retained, dirt and moisture kept out.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis Timken steels.

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